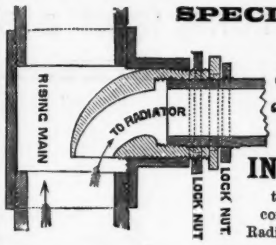
THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXX. No. 1805.] LONDON, DECEMBER 14, 1897. [49TH YEAR. PRICE 6d.

TUBES AND FITTINGS
FOR
GAS, STEAM WATER,
AND ALL PURPOSES,
ALSO
COILS OF EVERY SIZE AND SHAPE.

Apply to the Original Firm of
JOHN BROTHERTON
LIMITED,
Imperial Tube Works, Monmore Green,
WOLVERHAMPTON.
ESTABLISHED 1861.

GAS CONSUMERS'
REQUIREMENTS.
TUBES, COCKS, UNIONS, BRACKETS, PENDANTS, LANTERNS, CHANDELIERS, AND GENERAL FITTINGS.
MANUFACTURED BY
VAUGHAN & BROWN, LTD.,
15, 16, 17, Kirby Street, London, E.C.



SPECIALITE
FOR
HOT-WATER
CIRCULATION.
'ACME'
PATENT
INJECTOR,
to be fixed in connection with Radiators on Mains.

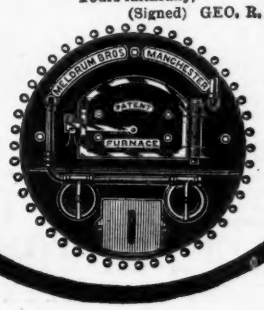
— ESTABLISHED 1830. —
PARKER & LESTER,
Manufacturers & Contractors.
THE ONLY MAKERS OF
PATENT ANTIMONY PAINT,
Parker's Imperial Black Varnish,
Oxide Paints, Oils, and General Stores, for Gas and Water Works.
WORKS:
ORMSIDE STREET, OLD KENT ROAD,
LONDON.

'BEAR CREEK' CANNEL
LOG MOUNTAIN COAL, COKE, AND TIMBER CO.
PINEVILLE, KENTUCKY, U.S.A.
Cable Address:
"HULL, PINEVILLE." Codes used "ABC" & "A1."
Communications to the Company only.

NORTON'S PATENT
"ABYSSINIAN" & ARTESIAN TUBE WELLS,
FOR TOWN WATER-WORKS AND OTHER SUPPLIES.
The following Town Water-Works Supplies have been obtained by this System, viz.:—Abbott's Langley, Aldershot, Alnwick, Cirencester, Hertford, Lechlade, St. Albans, Shrewsbury, Skegness, Southampton, Stony Stratford, Swansea, Wallingford, Watford, West Worthing, Wimborne, &c.
LE GRAND & SUTCLIFF,
HYDRAULIC ENGINEERS, 100, BUNHILL ROW, LONDON, E.C.

"MELDRUM" FURNACE
INVALUABLE FOR
GAS-WORKS
FOR BURNING
COKE BREEZE,
PAN BREEZE,
SWEEPINGS,
COAL DUST,
&c., &c.

The Engineer's Office, Gas-Works, Blackstonn Road, Paisley.
GEORGE R. HISLOP, C.E., F.C.S., Engineer and Manager.
Messrs. MELDRUM BROS., 101, St. Vincent Street, Glasgow. *June* 23, 1896.
DEAR SIRS,—In reply to your favour of even date, I have much pleasure in stating that the two Boilers fitted with the **"Meldrum Furnaces"** by your Firm last year are affording me the highest satisfaction; and, while confidently recommending their application to Steam-Boilers generally, their advantages in Gas-Works are such that none should be without them.
Yours faithfully,
(Signed) GEO. R. HISLOP.



ALSO USED IN CONJUNCTION WITH
TAR BURNING
ARRANGEMENT
WITH GREAT SUCCESS.
Write for Catalogue and other Testimonials.
RESULTS GUARANTEED.
Meldrum Bros.,
ATLANTIC WORKS, MANCHESTER,
ALSO AT
LONDON, LEEDS, LIVERPOOL,
BIRMINGHAM, NEWCASTLE, & GLASGOW.
BRANCH HOUSES AT
PARIS, NEW YORK, BOMBAY, TOKIO, and SYDNEY.

5400
WORKING.

DANIEL HOWARD,

(Successor to the late BENJ. WHITEHOUSE),

GASHOLDER & BOILER WORKS,

WEST BROMWICH, NEAR BIRMINGHAM

(ESTABLISHED 1765).

MANUFACTURER OF TELESCOPIC AND SINGLE GASHOLDERS,

WROUGHT AND CAST IRON TANKS FOR DITTO,

PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS, and all kinds of GAS APPARATUS,

Wrought-Iron Roofs, Bridges, Girders, &c.,

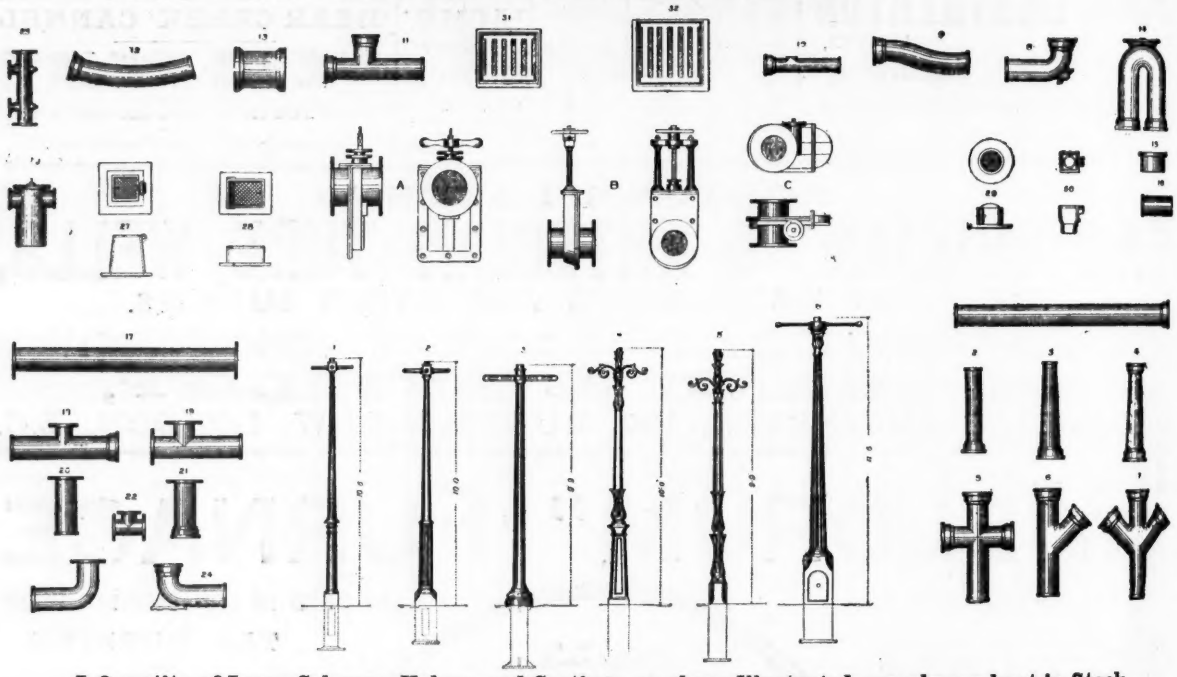
Steam, Hot Water, and Range Boilers, Tanks, Cisterns, Boats, and all kinds of Wrought-Iron Work.

DRAWINGS, SPECIFICATIONS, AND ESTIMATES SUPPLIED ON APPLICATION.

EDWARD COCKEY & SONS, Ltd.,

GAS ENGINEERS, CONTRACTORS, IRON & BRASS FOUNDERS, &c.

FROME, SOMERSET.



A Quantity of Lamp Columns, Valves, and Castings, as above Illustrated, are always kept in Stock ready for immediate delivery.

HIGHEST AWARDS—LONDON, PARIS, COLOGNE, VIENNA, MELBOURNE, AND OTHERS.

—11 MEDALS.—

MANUFACTURERS OF TUBES AND FITTINGS OF EVERY DESCRIPTION.

WROUGHT-IRON OR STEEL MAINS UP TO 6 FEET DIAMETER, FOR GAS, WATER, OIL, OR OTHER PURPOSES.

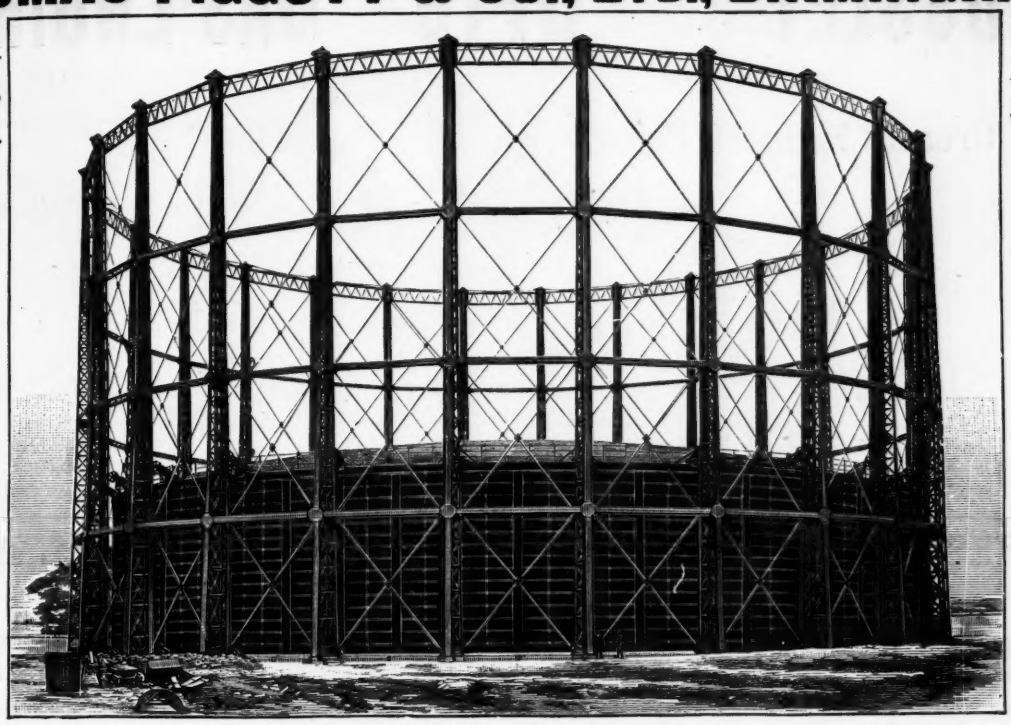
SCREWING TACKLE, BOILER MOUNTINGS, VALVES, COCKS, ETC.

LONDON:	MANCHESTER:	BIRMINGHAM:	LEEDS:
103, Southwark Street.	33, King Street West.	114, Colmore Row.	6, Mark Lane, New Briggate.

THOMAS PIGGOTT & CO., LTD., BIRMINGHAM.

LONDON OFFICE: ST. THOMAS APOSTLE, E.C.

GAS PLANTS, BOILERS, ENGINES, PUMPS, ROOFS, RETORT FITTINGS, ETC.



TELEGRAPHIC ADDRESS: ATLAS BIRMINGHAM

WELDED & RIVETED PIPES, FOUL MAINS, RETORT LIDS, WROT & CAST TANKS, PURIFIERS.

MANUFACTURERS OF

HUMPHREYS & GLASGOW'S

PATENT CARBURETTED WATER-GAS PLANT.

INSTALLATIONS HAVE ALREADY BEEN SUPPLIED, AND ARE IN HAND FOR THE FOLLOWING GAS-WORKS: COPENHAGEN, BELFAST, GLASGOW, BRUSSELS, SANTIAGO, SWANSEA, TOTTENHAM, LIVERPOOL, BRIGHTON, BATH, PRESTON, SOUTHPORT, NEW YORK, NEWBURGH (N.Y.), NEWBURGH (SECOND CONTRACT), HOYLAKE, BELFAST (SECOND CONTRACT), EDINBURGH, TOTTENHAM (SECOND CONTRACT), WINCHESTER, MANCHESTER, BRUSSELS (SECOND CONTRACT), ST. JOSEPH (MO.), HOLYOKE (MASS.), SHANGHAI, STOCKTON, STOCKPORT, NORWICH, GUILDFORD, SYRACUSE, BORDENTOWN, LEA BRIDGE, COVENTRY, COMMERCIAL, BRENTFORD, BRIDLINGTON, MIDDLESBROUGH, CROYDON, L. & N.W. RY. CREWE, NINE ELMS, BROMLEY, COVENTRY (SECOND CONTRACT), TAUNTON, ROTTERDAM, DORKING, LEA BRIDGE (SECOND CONTRACT).

JOSEPH EVANS & SONS, CULWELL WORKS, WOLVERHAMPTON.

Telegrams: "EVANS WOLVERHAMPTON."

PLEASE APPLY FOR CATALOGUE No. 8.

National Telephone No. 7039.

12,000 PUMPS IN STOCK AND PROGRESS.

TRADE MARK.

NO TAPPETS.

Fig. 705. "SINGLE RAM" STEAM-PUMP.

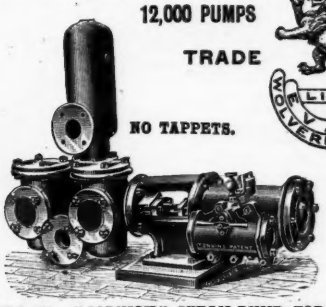


Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

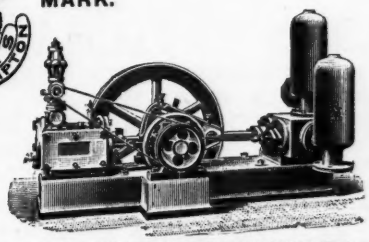


Fig. 685. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

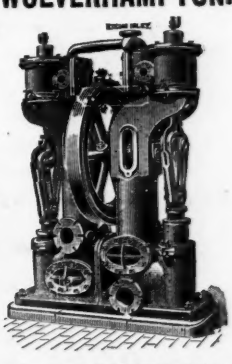
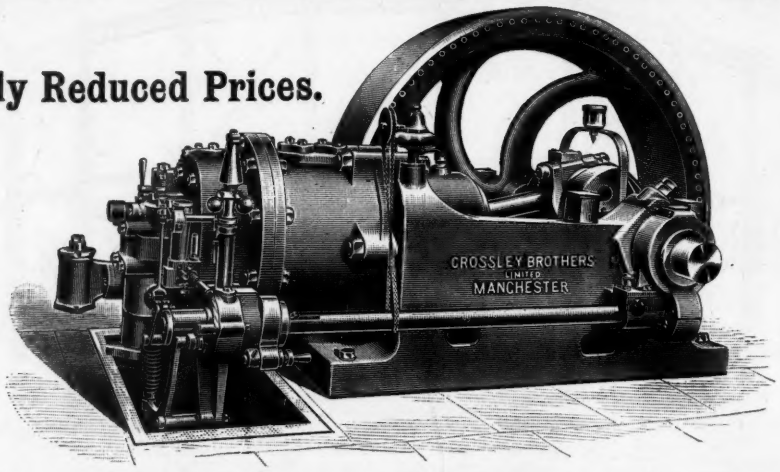


Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

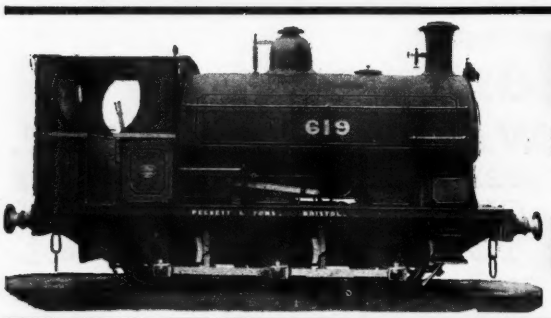
CROSSLEY'S "OTTO" GAS-ENGINES

Greatly Reduced Prices.



REPRESENTS NEW TYPE 40-HORSE POWER NOMINAL HIGH-SPEED ELECTRIC-LIGHT ENGINE.

CROSSLEY BROS., LTD., OPENSHAW, MANCHESTER.



LOCOMOTIVES

LOCOMOTIVES of all Sizes and Gauges specially constructed for Main and Branch Lines, Contractors, Docks, Gas-Works, Collieries, Iron-Works, Brick and Cement Works, &c. Locomotives of various Sizes always in Stock, ready for Immediate Delivery.

Photographs, Specifications, and Prices on Application.

PECKETT & SONS, Atlas Locomotive Works, BRISTOL.

Telegraphic Address: "PECKETT, BRISTOL."

NEWTON, CHAMBERS, & CO., LIMITED,

THORNCLIFFE IRON-WORKS, near SHEFFIELD,

MANUFACTURERS OF

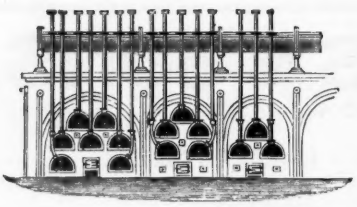
SLIDE VALVES, WITH RACK & PINION OR Internal or External SCREWS of all sizes.

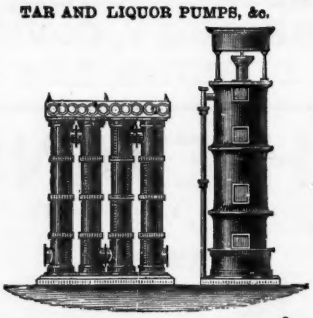
GASHOLDERS, AND Gasholder Tanks.

CAST-IRON RETORTS, RETORT-BED FITTINGS, *And Retort-House Appliances* of every description, Iron Roofs, Columns, Girders, Floor Plates, Tools, &c.

WROUGHT AND CAST IRON CONDENSERS, SCRUBBERS, & WASHERS, TAR AND LIQUOR PUMPS, &c.

PATENT CENTRE-VALVES for working Purifiers, Also Bye-Pass & Stop Valves.



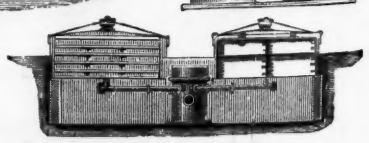


PURIFIERS with Planed Joints,

HAND and HYDRAULIC LIFTING GEAR, CAST-IRON MAINS, and SPECIALS.

WOOD GRIDS.

CAST AND WROUGHT IRON TANKS AND CISTERNS.



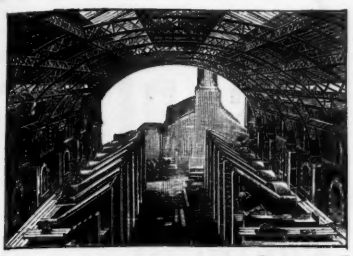
DESIGNS, SPECIFICATIONS, AND ESTIMATES FREE.

Pig Iron (*Special Quality*) for ENGINE CYLINDERS, &c.

GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

W. C. HOLMES & CO.

IRONFOUNDERS AND CONTRACTORS.

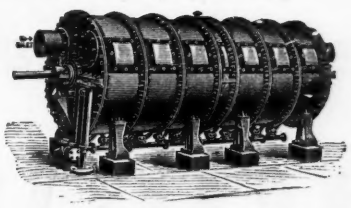


Makers of
GAS & CHEMICAL
PLANT.

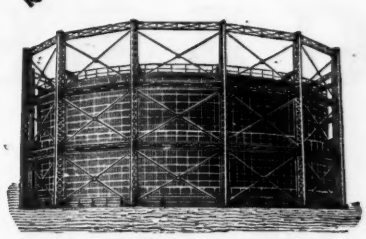
Telegrams:
"HOLMES, HUDDERSFIELD."

Improved
PATENT SCRUBBER-WASHERS,
All sizes,
From 50,000 to 5,000,000 Cubic Feet of Gas per day.
Results unrivalled. Send for Particulars and Prices.

MALLEABLE
and all Kinds of
CASTINGS.



GASHOLDERS of Improved Construction and of all Sizes.
ROOFS, BRIDGES, TANKS, GIRDERS.



Improved
BYE-PASS and
CENTRE-VALVES,
GOVERNORS,
and METERS.

Rotary or Pump
EXHAUSTERS.

80, CANNON STREET, LONDON,
AND
WHITESTONE IRON WORKS, HUDDERSFIELD.

THE
MAXIM PATENT CARBURETTOR

FOR ENRICHING GAS IN BULK.

Over 50 Maxim Patent Carburettors have now been fixed, capable of enriching

650,000,000

CUBIC FEET OF GAS PER DAY.

Among the Companies supplied are The Gaslight and Coke Company, the South Metropolitan Gas Company, Birmingham Corporation, Manchester Corporation, Rochdale Corporation, Bristol Gas Company, and many other Works, both large and small, where they have been working in some instances for the past **FOUR YEARS.**

More Gas and saleable Coke per ton of Coal Carbonized is produced; saving Capital, Labour, Fuel, Wear and Tear, &c.

The Enrichment is **INSTANTANEOUS** and **PERMANENT.**

The Carburettor is inexpensive, easily fixed, and entirely supersedes the use of Cannel.

SOLE AGENTS FOR REDWOOD & CLOWES' INFLAMMABLE VAPOUR & GAS DETECTORS.

Dealers in Carburine and all other Naphthas for the Enrichment of Gas.

FOR PRICES AND FULL PARTICULARS, APPLY TO

THE GAS LIGHTING IMPROVEMENT COMPANY, LIMITED,

18, DEVONSHIRE STREET, BISHOPSGATE, LONDON, E.C.

S. CUTLER AND SONS, MILLWALL, LONDON.

CARBURETTED WATER-GAS PLANT.

(CUTLER'S PATENTS)

ADOPTED AT HORNSEY, HASTINGS, SOUTHEND,

PLYMOUTH, BUENOS AYRES, SOUTHALL (BRENTFORD GAS COMPANY)

GASHOLDERS

OF EVERY SIZE AND DESCRIPTION.

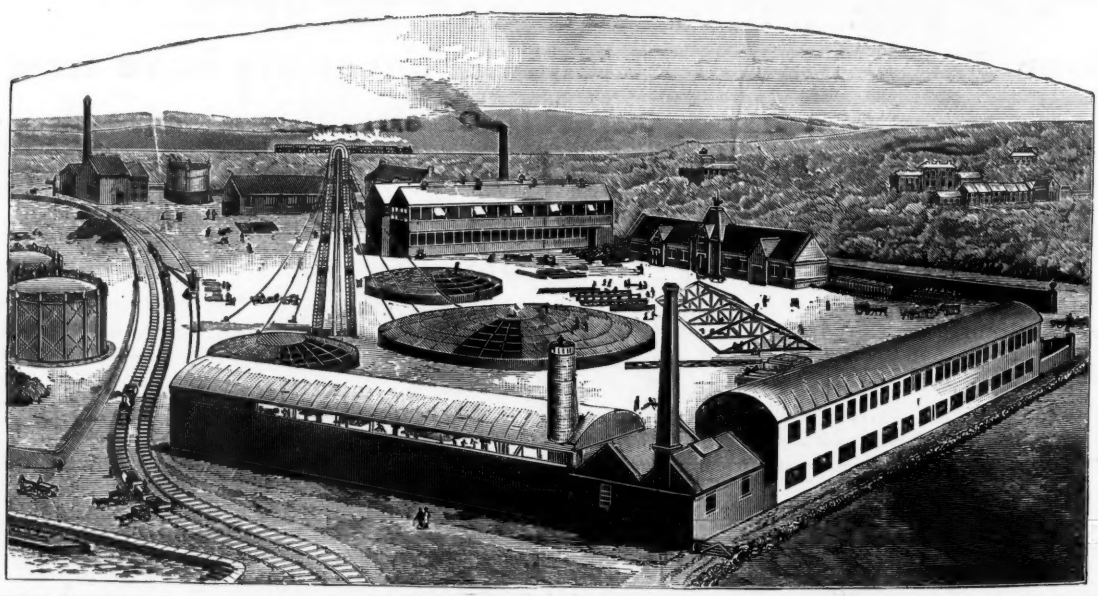
CUTLER'S PATENT GUIDE-FRAMING FOR GASHOLDERS

HAS BEEN ADOPTED FOR MANY IMPORTANT HOLDERS.

IT IS STRONG AND CHEAP, AND REQUIRES NO PIERS FOR ITS SUPPORT.

WILLEY & CO., GAS ENGINEERS.

OFFICES: EXETER. WORKS: 248, Kingsland Road, LONDON; James St., and St. Thomas, EXETER.



MANUFACTURERS OF WATER-GAS PLANT, GASHOLDERS, GAS-FITTINGS, GAS APPARATUS.

WET AND DRY CONSUMERS' METERS, AUTOMATIC METERS—PENNY-IN-THE-SLOT.

CONTRACTORS TO THE GOVERNMENT.

Telephone 132. Telegraphic Address: "WILLEY, EXETER."

INCANDESCENT GAS-LIGHT

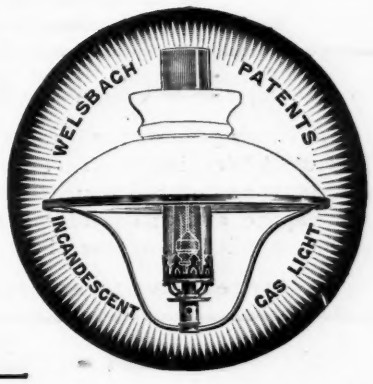
(WELSBACH PATENTS).

THE GREATLY REDUCED CONSUMPTION OF GAS COVERS THE INITIAL COST OF THE BURNER IN LESS THAN SIX MONTHS.

The Ordinary "C" Burner,
PRICE 6/6.

The "C" Bye-Pass Burner,
PRICE 7/6.

Prices of other Patterns Reduced Proportionately.



The attention of Gas Managers and Gas Engineers is called to this System of Lighting as one which tends to **Popularize the Use of Gas** as an Illuminant, owing to the following Advantages:—

Economy in Consumption of Gas, combined with High Illuminating Efficiency.
Freedom from Smoke, Dirt, and Flickering.
Greatly Reduced Heat.
The combination of High Lighting Power with DURABILITY can only be obtained by The Welsbach System.

The **"Lancet" Special Analytical and Sanitary Commission,** in an exhaustive report, pronounces the "Incandescent Gas-Light System" to be the **Healthiest, Best, and most Economical System of Gas Lighting.**

Suitable for every purpose of **Inside and Outside Lighting.**

Avoid the WORTHLESS IMITATIONS now being offered by UNSCRUPULOUS INFRINGERS.

OVER ONE HUNDRED AND FIFTY JUDGMENTS

and Interim Injunctions recently obtained against Companies, Firms, and Persons INFRINGING THE "WELSBACH" PATENTS, or INFRINGING THE LIMITED LICENSE under which the Mantles are sold.

FOR FURTHER PARTICULARS, APPLY TO

THE INCANDESCENT GAS-LIGHT COMPANY, Ltd.,
PALMER STREET, WESTMINSTER, LONDON, S.W.

ARROL-FOULIS
Patent Automatic Machinery
FOR
DRAWING AND CHARGING GAS-RETORTS.

Full Particulars may be obtained from the Sole Makers,

SIR WILLIAM ARROL & CO., Limited,
GLASGOW.

[See Illustrated Advertisement, Dec. 7, p. 1259.]

TELEGRAPHIC ADDRESS: "GAS, LEEDS."

CLAYTON, SON, & CO.
LIMITED,
LEEDS,
MAKE
RETORT LIDS
OF ALL FORMS AND SHAPES
IN IRON OR STEEL
BY SPECIAL HYDRAULIC MACHINERY.

LONDON OFFICE: 80, QUEEN VICTORIA STREET, E.C.

PRICES ON APPLICATION.

H. KIRKHAM & CO.

Are now prepared to Tender for **SCRUBBER-WASHERS** fitted with their Patent Basket or Cage, with Improved Washing Surface. It is acknowledged to be the **MOST EFFECTIVE MACHINE** for extracting Ammonia and other Impurities from Coal Gas. It is guaranteed to Purify 20 per cent. more Gas in the same space, and at considerably less cost per Machine. The Baskets and Scrubbing Surface can be readily applied to all the sizes of the Kirkham, Hulett, and Chandler Machines now in use.

Office: 335, MANSION HOUSE CHAMBERS, LONDON, E.C.

G. & J. HAIGH,
Raven's Lodge Fire-Brick Works, DEWSBURY.

FIRE-BRICKS of the highest Quality, made from Fire-Clay of a most Superior and Refractory Character, suitable for **GLASS-WORKS, GAS-WORKS, and BLAST-FURNACES.**

WHITE GLAZED AND SALT GLAZED BRICKS, BUFF FACING BRICKS, &c.

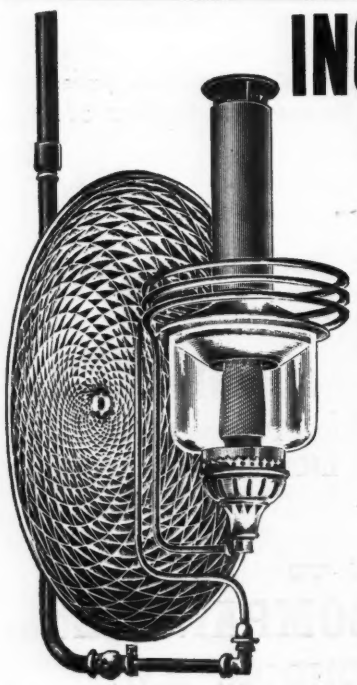
For Prices and Analysis, apply as above.

STOKERS' GLOVES.

GEO. BOULTON & SON, Wholesale Glove Manufacturers, **75, Goswell Rd., London, E.C.**

Will be pleased to send Sample Patterns and Prices to the Managers and Engineers of Gas Companies, similar to those which have been supplied by them to the South Metropolitan Gas Co., The Gaslight and Coke Co., Commercial Gas Co., and others, for 30 years past.

ALL KINDS OF STOUT LEATHER GLOVES for FURNACE or SMELTING WORKS MADE TO ORDER.



INCANDESCENT GAS LIGHTING

May now be adopted **IN MILLS** and all kinds of **WORKS**; and, however severe the VIBRATION may be,

CLAY'S PATENT SHOCK-PROOF FITTINGS

are the next best things to **UNBREAKABLE MANTLES.**

The Illustration shows one arrangement for Mills or Works. Made of **ONE PIECE OF PURE COPPER TUBE**, it is **THE VERY ACME OF SIMPLICITY AND DURABILITY!**

WRITE FOR OUR ILLUSTRATED CATALOGUE WITH FURTHER INFORMATION.

WARNING: As we hold the Master Patents covering the Coiling of Supply Pipes to obtain a resilient bearing to neutralize the damaging effect of Shock or Vibration on the Mantles of Incandescent Burners, we shall not hesitate to immediately **INSTITUTE PROCEEDINGS** against anyone **INFRINGING OUR RIGHTS.**

CLAY & WALMSLEY,
(Late W. R. CLAY & CO.)
BOLTON, LANCASHIRE, ENG.

Telegrams: "CLAYS, BOLTON." See Illustrated Advt. in "JOURNAL" Nov. 30, p. 1155.

BRAY'S

"SPECIAL" & "ADJUSTABLE SPECIAL"

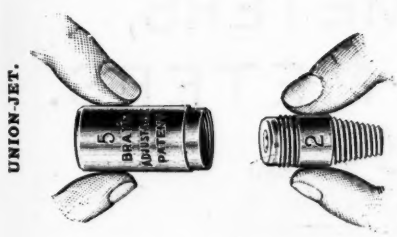
BURNERS.

Suitable for all Pressures and Conditions, are without exception the

GREATEST LIGHT PRODUCERS,

the most Durable, and in the end the

CHEAPEST IN THE WORLD.



Endorsed by the Leading Gas Companies of the World.

SEND FOR CATALOGUE AND PRICE LIST GIVING FURTHER PARTICULARS OF BURNERS MANUFACTURED BY US.

GEO. BRAY & Co.

GAS-LIGHTING ENGINEERS,

Bagby Works, LEEDS.

GIBBONS BROTHERS, LIMITED,

Telegraphic Address: "GIBBONS, DUDLEY."

DUDLEY,

Telephone No. 8013.

GAS ENGINEERS, CONTRACTORS, RETORT SETTERS.

Patent REGENERATIVE SETTINGS,

GIBBONS & MASTERS' PATENT No. 1269, 1893.

SUITABLE FOR WORKS OF EVERY CAPACITY,

AND A SPECIAL FORM OF WHICH IS APPLICABLE TO

GASEOUS FIRING WITH A MINIMUM EXCAVATION.

RETORT-BENCH IRONWORK, CONDENSERS, SCRUBBERS, PURIFIERS, VALVES, &c.

DESIGNS AND ESTIMATES ON APPLICATION.

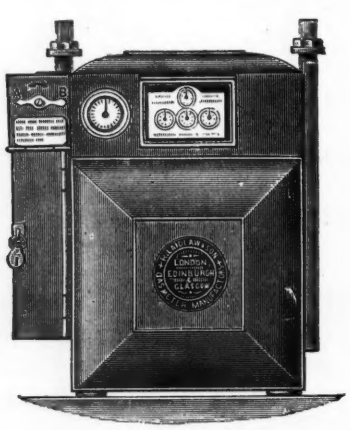
R. LAIDLAW & SON

GAS & WATER ENGINEERS.

MANUFACTURERS OF WET & DRY GAS-METERS,

SIEMENS WATER-METERS,

PREPAYMENT GAS-METERS.



—DRY METER.—

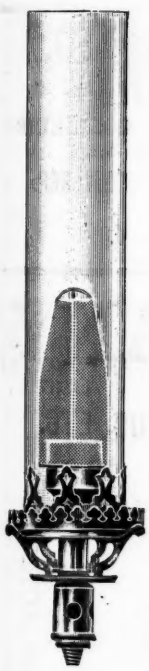
—WET METER.—

EDINBURGH: SIMON SQUARE WORKS. | **GLASGOW:** ALLIANCE FOUNDRY. | **LONDON:** 6, LITTLE BUSH LANE.

THE SUNLIGHT INCANDESCENT GAS-BURNER.

NEW POPULAR PRICES.

BURNERS

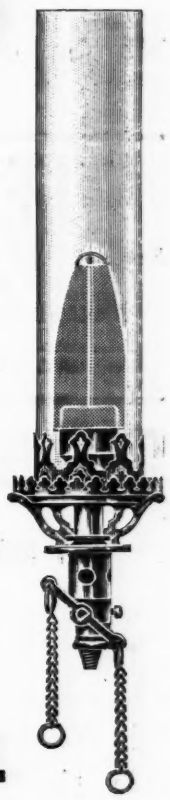


COMPLETE FROM

3/10 each.

WITH BYE-PASS, 5/-.

MANTLES



per 9/- doz.

THE IDEAL LIGHT FOR DOMESTIC USE.

SUNLIGHT MANTLES

PRODUCE A DIFFUSED LIGHT OF SOFT RAYS,

The NEAREST APPROACH to the LIGHT of the SUN.

Price Lists, &c., on application.

The NEW INCANDESCENT (SUNLIGHT PATENT) GAS LIGHTING CO., LIMITED,

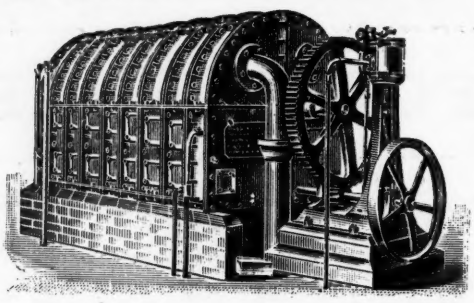
33 & 34, SHOE LANE, LONDON.

KIRKHAM, HULETT, & CHANDLER, LD.

3 & 4, PALACE CHAMBERS, BRIDGE STREET, WESTMINSTER, S.W.

PATENT "STANDARD" WASHER-SCRUBBER.

This Apparatus upholds its title, the "STANDARD;" being recognized by leading Engineers as the most efficient Apparatus for the Extraction of Ammonia from Coal or other Gases.



The Largest Order ever given for WASHER-SCRUBBERS was recently received being for **16** Patent "Standard" Washer-Scrubbers, each for 3,500,000 Cubic Feet of Gas per day.

Number of Patent "STANDARD" Washer-Scrubbers in use at this date

540

THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

Midland District Office: PRINCE'S CHAMBERS, 6, CORPORATION STREET, BIRMINGHAM—Sole Agent: A. C. SCRIVENER.

TELEGRAPHIC ADDRESS: "WIGAN BIRMINGHAM." TELEPHONE No. 200.

London District Office: 6, STRAND, LONDON—C. PARKER & SON, Sole Agents.

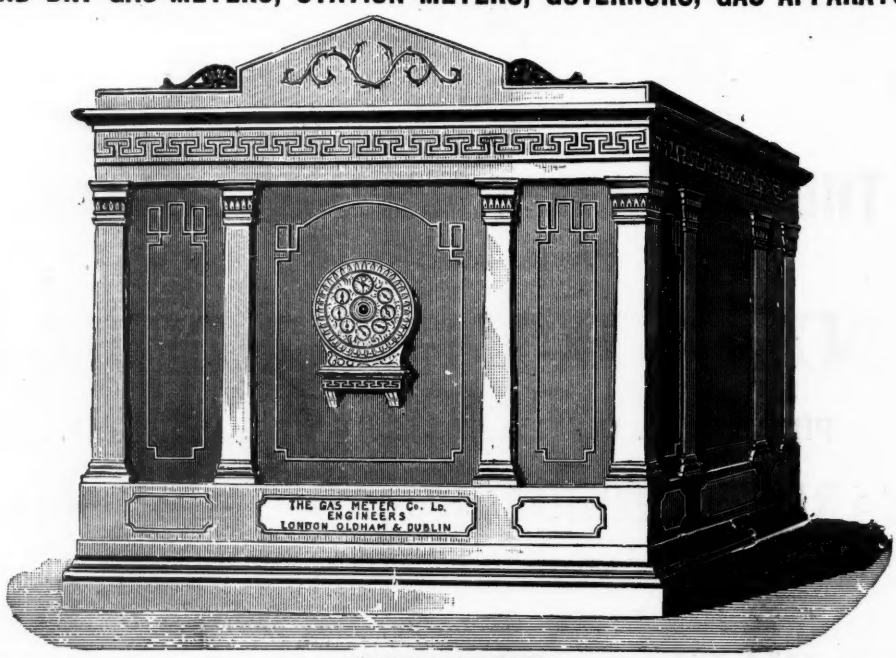
TELEGRAPHIC ADDRESS: "PARKER LONDON."

THE GAS-METER COMPANY, LIMITED,

MANUFACTURERS OF

WET AND DRY GAS-METERS, STATION METERS, GOVERNORS, GAS APPARATUS, ETC.

SQUARE STATION METERS WITH PLANED JOINTS.



STATION METERS IN CYLINDRICAL CASES.

DESIGN No. 2 PATTERN.

STATION METERS MADE AT THE COMPANY'S WORKS, OLDHAM, LATE WEST & GREGSON. Established 1830.

For Prices and Particulars apply to

R. L. ANDREWS, General Manager.

Works: 238, KINGSLAND ROAD, LONDON; UNION STREET, OLDHAM; HANOVER STREET, DUBLIN.

Telegraphic Address: "METER."

[See Advertisement on back of Wrapper.

ALEX. C. HUMPHREYS, M.Inst.C.E. A. G. GLASGOW, M.E.

SINCE 1893

MESSRS. HUMPHREYS & GLASGOW

Have constructed or have in hand

CARBURETTED WATER-GAS PLANT

FOR THE FOLLOWING UNDERTAKINGS:—

	Cub. Ft. Daily.		Cub. Ft. Daily.
Copenhagen	700,000	Norwich	1,000,000
Belfast	1,700,000	Holyoke, Mass.	600,000
Belfast (Second Contract)	4,500,000	Edinburgh	2,000,000
Glasgow	300,000	Stockport	500,000
Brussels	700,000	St. Joseph, Mo.	750,000
Brussels (Second Contract)	700,000	Lea Bridge	350,000
Liverpool	3,500,000	Lea Bridge (Second Contract)	350,000
Tottenham	750,000	Guildford	350,000
Tottenham (Second Contract)	750,000	Stockton-on-Tees	500,000
Santiago	400,000	Syracuse, N.Y.	850,000
Swansea	750,000	Brentford	1,200,000
Manchester	3,000,000	Commercial Gas Co.	850,000
Brighton	1,750,000	Commercial Gas Co. (Second Contract)	850,000
Preston	1,500,000	Bridlington	125,000
New York	1,200,000	Middlesbrough	1,250,000
Southport	750,000	Croydon	1,250,000
Bath	1,000,000	L. & N.W. Railway, Crewe	700,000
Newburgh, N.Y.	350,000	Taunton	225,000
Newburgh, N.Y. (Second Contract)	250,000	Lawrence, Mass.	400,000
Hoylake	125,000	Rotterdam	850,000
Coventry	600,000	Dorking	125,000
Coventry (Second Contract)	600,000	McKeesport, Pa.	500,000
Bordentown, N.J.	125,000	The Gaslight and Coke Co., Bromley	3,600,000
Winchester	200,000	The Gaslight and Coke Co., Nine Elms	2,650,000
Shanghai	225,000	New York (Remodelled)	11,000,000

LIVERPOOL (Second Contract) . . . . . 4,500,000 Cubic Feet.

In addition to which the 1891 Installations of The Gaslight and Coke Company, on the Humphreys' Double-Superheater System, have a capacity of 12,000,000 Cubic Feet per diem.

IN THE UNITED STATES,

Messrs. Humphreys and Glasgow and the United Gas Improvement Company have jointly constructed **248** Sets of Humphreys' Double-Superheater Apparatus; **135** of these since **1893.** This Company (of which Mr. Humphreys was formerly Chief Engineer) were, until lately, the largest Constructors of Carburetted Water-Gas Apparatus in the World.

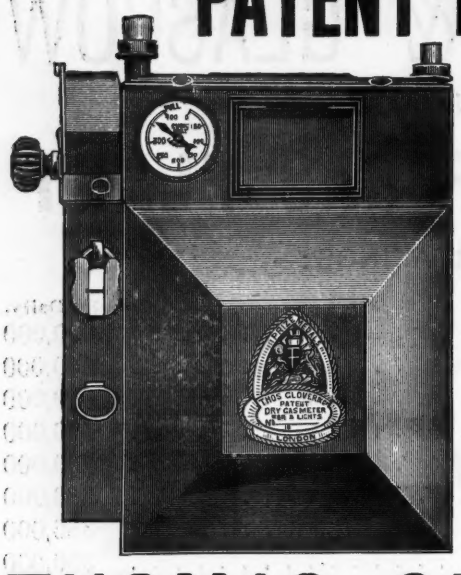
AT THE PRESENT TIME, MESSRS. HUMPHREYS & GLASGOW, OF LONDON, HOLD THAT POSITION.

9, VICTORIA STREET, LONDON, S.W.
Telegrams: "EPISTOLARY, LONDON."

UNITED STATES OFFICE:
BANK OF COMMERCE BUILDING, NEW YORK.

THOMAS GLOVER & CO.'S

PATENT NEW IMPROVED PREPAYMENT METER



For Pennies, Shillings, or any Coin.

Simple in Mechanism.
Positive in Results.
Price Changer *in Situ.*

GUARANTEED FOR FIVE YEARS.

Telegraphic Address: "GOTHIC LONDON." Telephone No. 6725.

THOMAS GLOVER & CO., LTD.,

DRY GAS-METER MANUFACTURERS,

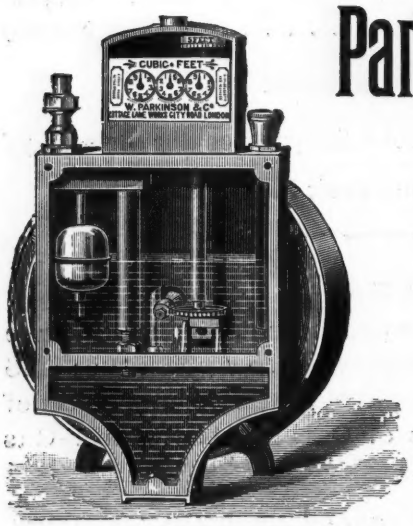
214 to 222, ST. JOHN ST., CLERKENWELL GREEN, LONDON, E.C.

BRISTOL:	BIRMINGHAM:	MANCHESTER:	GLASGOW:
28, BATH STREET.	1, OOZELLS STREET.	37, BLACKFRIARS STREET.	ARGYLE WORKS, KINNING PARK.
Telegraphic Address: "GOTHIC."	*Telegraphic Address: "GOTHIC."*	*Telegraphic Address: "GOTHIC."*	*Telegraphic Address: "GASMAIN."*

W. PARKINSON & CO.

MANUFACTURERS OF WET & DRY METERS.

OLDEST ESTABLISHED FIRM IN THE TRADE.



Parkinson's Cast-Iron Case Meter.

Works with very little friction.

Will stand very high pressures.

Cannot possibly be shut off by sudden increase of pressure; the float being affected by outlet gas only.

Allows for loss of water by evaporation without materially affecting the registration or shutting off the gas.

Unexcelled for Simplicity of Construction, Excellence of Workmanship, and Accuracy of Registration.

COMPENSATING METERS,

In Tinned or Cast-Iron Cases.

COTTAGE LANE WORKS, CITY ROAD,
LONDON.
Telegraphic Address: "INDEX LONDON."

BELL BARN ROAD WORKS,
BIRMINGHAM.
Telegraphic Address: "GAS-METERS, BIRMINGHAM."

(See also Advt, p. 1320.)

CONTENTS.

EDITORIAL NOTES:—
GAS, LIGHTING, &c.— PAGE
Engineering Strike—What is Legitimate Trade Union Action? . 1279
A Point of Patent Law 1280
The Responsibility for Gas-Mains and Steam-Rollers 1280
The County Council and the Taxation of Ground Rents . . . 1280
"Home" Science and Literature 1281
WATER AND SANITARY AFFAIRS—
The Metropolitan Water Supply Commission—Further Evidence for the London County Council 1281
Mr. F. Tendron's Address at the Grand Junction Water Company's Meeting—Thames Water *v.* Mineral Waters 1281
ESSAYS, COMMENTARIES, AND REVIEWS:—
Gas and Water Companies in the Stock Market. 1282
Electric Lighting Memoranda 1282
Welsbach Incandescent Gas-Light Company, Limited. . . . 1283
The Manchester Corporation and Technical Education . . . 1284
NOTES:—
Pear-Shaped Glasses for Incandescent Gas-Light 1286
Action of Nitric Oxide on Acetylene 1285
The Strength of Wooden Beams and Columns 1286
English and American Water Filtration Systems 1286
Dock Lighting by Acetylene. 1286
Fletton Bricks 1286
A New Coal Calorimeter 1286
The Detection of Impurities in Air by Liquefaction 1286
The Ventilation of the Senate Chamber, Washington 1286
TECHNICAL RECORD:—
Determination of the Efficiency and Loss of Heat in Gas-Stoves. 1287
Society of Chemical Industry—The Distillation of Shale . . . 1283
REGISTER OF PATENTS:—
Acetylene Gas Generator, Purifier, and Container—Fowler, T. R. 1289
Burners for Acetylene Gas—Wise, W. L. (Billwiller, J. S.) . . 1289
Incandescence Bodies—Langhans, R. 1289
Gauges—Helps, J. W.. 1289
Inverted Regenerative Incandescent Burners—Kent, H. A. . . 1290
Incandescent Mantles—Foster, F. R. 1290
Gas-Stoves—Johnson, J. 1290
Repairing Gas and Water Pipes and Mains—Barnett, A. E. . . 1290
Automatic Gas-Igniting Device—Killing, C. 1290
Producing Acetylene Gas—Flock, A., and Messedat, F. . . . 1291
Patent Notices 1291
CORRESPONDENCE:—
The Extinction of Gas Companies 1291
Gaseous Firing 1292
Gas Workers' Superannuation 1292
The Collection of Gas Accounts. 1292
Mr. Skinner's Article on Gas Distribution. 1293
LEGAL INTELLIGENCE:—
High Court of Justice—Queen's Bench Division—Driscoll and Wife *v.* Poplar District Board of Works; Damage to Gas-Mains by Steam-Rollers 1293
The Incandescent Gas-Light Company's Patents 1294
The Sheffield Corporation and the Sheffield Electric Light and Power Company's Undertaking 1294
Unlawfully Using Water for Other than Domestic Purposes . . 1294
MISCELLANEOUS:—
The Proposed New Site for the Edinburgh and Leith Gas-Works—Reports by Mr. W. R. Herring and Mr. G. Livesey . . . 1294
Extension of the Manufacturing Plant at the Chorley Gas-works. 1295
Additional Storage at the Ipswich Gas-Works—Inauguration of a New Holder 1296
Gas-Works Extensions at Chesterfield—Local Government Board Inquiry 1296
Sales of Stocks and Shares 1297
Electric Lighting Notes 1297
The Metropolitan Water Supply Commission—Second Day . . 1298
Meeting of the Grand Junction Water-Works Company . . . 1300
Notes from Scotland 1302
Gas and Water Companies' Stock and Share List 1302
Coal Trade Reports 1304
Current Sales of Gas Products 1304
PARAGRAPHS:—
OBITUARY: Mr. H. J. Baugust; Mr. C. H. Read; Mr. Banford Williamson 1285
PERSONAL: Mr. George Ryle; Mr. Thomas Hulme; Mr. Charles J. Hobbs; Mr. Harry Shepard; Mr. W. Liddall; Mr. Leonard S. Marsh; Mr. W. Duff; Mr. T. Walker; Mr. H. Perrin; Mr. J. H. Darby; Mr. J. Mactear; Mr. J. Tysoe; Mr. J. T. Rodda; Mr. W. Arthur Valon 1285
The Subject-Paper of The Gas Institute—Acetylene *v.* Electricity for Lighting Buoys—Gas-Engines in Chemical Works—A New Concrete Mixer 1282
British Association of Water-Works Engineers 1283
The "Richmond" Cookery-Book—The Electric Light and Eyesight 1285
Wokingham Corporation Gas Supply—Issue of New Capital by the Hartlepool Gas and Water Company—The Public Lighting of Plymouth 1293
Public Lighting by Denayrouze Burners—The Damage to Gas-Works by Flood 1295
Heywood Corporation Gas-Works 1296
Kidderminster Town Council and the Gas-Works—The Proposed Gas Loan of the Vienna Municipality—The City of London and the Water Question 1298
Southwark and Vauxhall Water Company 1301
Ossett Corporation Borrowing Powers and Sinking Funds—Municipalities and their Contracts in the United States. . . 1303
Smoking Concert at the Midland Iron-Works 1304
The East Northumberland Water Scheme and the Supply of Cowpen—Heywood Corporation Water Bill—Matlock Water-Works Purchase Scheme—Bristol Town Council and the Water-Works—Street Lighting in Liverpool 1305
Filey Gas and Water Works Purchase Question—The New Water Reservoir for Merthyr Tydfil—The Competiton Between Gas and Electric Lighting in America—New Storage Reservoir for Cardiff—Water-Works Improvements at Barry 1306

TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

EDITORIAL NOTES.

The Engineering Strike—What is Legitimate Trade Union Action?

THE past week was a period of suspense in the disturbed engineering trade. The operation of taking a vote of the Society men upon the employers' proposals published in the last issue of the "JOURNAL" was in progress; and at the moment of writing it appears certain that the vote will be overwhelmingly against the acceptance of these terms. This result may at the first blush look like an endorsement of the policy of the strike leaders; but in reality it will have very little effect upon the final settlement, except that of making more complete the rout of militant Trade Unionism. For if the vote of the men proves to be of the anticipated character, it means that the conference fails, and the further lock-out notices which have been held in suspense during the negotiations will be made operative forthwith. Consequently, by the end of the Christmas holidays, the number of Society men shut out from employment will be largely augmented, while the war-chest of the Trade Union will be empty. Deeply as one may sympathize with the silent victims of their leaders' folly, it is futile to affect not to see that their prospects are becoming more and more desperate with every week of their enforced idleness. It is false kindness to them to pretend, as the "popular" newspapers do, that the employers and the mechanical industries of the country are suffering to anything like the same extent as they are. On the contrary, with the clearing out of the old hands from many a shop, an opportunity of making a clean sweep of abuses has been afforded to the employers, which they have not been backward in seizing. Handy labourers and smart young clerks and draughtsmen have been put in charge of labour-saving machinery; and the capabilities of such machinery have for the first time been realized by the employers. It is the tale of the gas workers' strikes over again. Under the old conditions, the superior advantages of labour-saving machines were not appreciated by English employers, who were, as a rule, contented with, and often proud of, the expertness of their workmen. With the disaffection of the men came the supremacy of the machine. When the men declared war against the machines, they committed an act of industrial suicide. There was a touch of human nature in the act, which showed that, when it came to their own turn, the mechanics were not more disposed to be tolerant of the "iron man," or to make friends with it, than the comparatively ignorant gas workers had been. Nevertheless, the slip was fatal. What the mechanic should have done was to take hold of every machine put into his hands and work it for all it was worth. He would thus have improved his own position both financially and in the hierarchy of the works. Left to himself, as the non-unionist workman is, he would probably have done this. Not only would British engineering output have been increased, but the improvement of labour-saving machines would have progressed apace, to the credit and profit of the British engineering industry generally.

Unfortunately, the Trade Union interfered. Having "rated" the men, it next proceeded to "rate" the machines, under the delusion, over and over again avowed on the one side and exposed on the other, that the engineering work of the country is a fixed quantity, which should be spread over as many workers as possible by everyone employed doing as little as he could. For years British employers have struggled in the toils of this entanglement, which was ever tightening round them. They dared not introduce a labour-saving machine into a shop for fear of creating a commotion among the hands; or if they did, the men soon let them see that it would not save labour. Meanwhile, British engineering was being passed in the race by other manufacturing nations working with a freer hand. Melancholy proof of this is supplied by the report of Mr. Joseph Horner to "Engineering" of the 3rd inst. on the machinery exhibits at the Stanley and National Cycle Shows: "English manufacturers are scarcely repre-"sented. . . . Here is a huge national industry which "has grown up during (say) about twenty years. There "are scores of factories, and many thousands of hands "engaged in the manufacture of cycles; yet the best "equipped of these factories, the most modern, the most "successful, are equipped wholly, or almost wholly, not "with English, but with American machine tools." This branch of the engineering trade is typical of the whole.

An attempt has been made to raise a quibble over the meaning of the term "legitimate action of Trade Unions," which the Federated Employers have denied any intention of interfering with. The quibble is an idle one, because the employers know perfectly well what they mean by the phrase they have used, and are not in the slightest degree likely to take any other view of it. It has occurred to a few busybodies outside the trade, including Mr. Frederic Harrison and Mr. Sidney Webb, that they are "eminent authorities" on the principles of Trade Unionism; and they have graciously supplied the "Daily News" with their opinion as to what the term means. Their definition is that "it is a fundamental "principle of Trade Unionism to replace individual "bargaining between the wage-earner and the employer, "by collective bargaining between the whole body of "organized workmen and their employers." This being so, it is sufficient to observe that individual employers, having had ample experience of the operation of the principle of "collective bargaining," have a perfect right to say they will have no more of it. Even these "eminent "authorities" leave it an open question "whether or not "this substitution of collective bargaining and collective "agreements for the negotiations between individual "workmen and individual employers is considered advan-"tageous to either party or to the community." The engineering employers say that the action of the Trade Unions has become intolerable by themselves and detrimental to the trade; and that these bodies must in future restrict their operations within harmless limits, in which the "legitimate principle" may disport itself at the pleasure of the wire-pullers. Another example of the inadmissibility in practice of this "legitimate "action" of collective bargaining is supplied by the recent railway men's agitation, which was so uncompromisingly quelled by the Railway Companies and the President of the Board of Trade. In this case, sad to say, Mr. Ritchie did not take the trouble to ask "eminent authorities" whether the programme of the Executive of the Amalgamated Society of Railway Servants came within the scope of the "legitimate action of Trade Unions," but pricked the bubble of the agitation, which forthwith collapsed. We have not noticed that this salutary action has called down many newspaper denunciations on the head of the President of the Board of Trade. Not that this makes the slightest difference either way; but the circumstance suggests some curious reflections.

A Point of Patent Law.

THOSE who watch the practice of the Courts in disposing of patent cases have been led of late to form the opinion that a marked and most important change has come over the judicial spirit. It looks as if that meritorious, but usually most unfortunate person, the original inventor, were being more tenderly handled by the Judges than he used to be under the old system. It is, of course, necessary to practise the utmost reserve in drawing general inferences from particular decisions; but a good example of judicial liberality in interpreting a patentee's performance is afforded by the judgment of the Court of Appeal in *Brooks v. Lamplugh*, given in the past week. Here was an invention which consisted simply in applying a well-known mechanical contrivance—to be particular, a truss beam—to a new purpose, namely, the construction of a bicycle saddle, with the object of gaining strength and rigidity combined with lightness. Not unnaturally, objection was taken to this patent that there was no invention, in the legal sense, in making this use of so familiar a mechanical contrivance. The difficulty to be overcome by those who said this, however, was the fact that nobody did it before the patentee; when, of course, it became obvious. We mention this case for the reason that, in delivering the judgment of the Court, Lord Justice Smith took the unusual course of stating the principle of law governing such cases in general terms, which every patentee would do well to lay to heart. This is the statement: "Although there could "not be a valid patent for a well-known mechanical con-"trivance, merely when it was applied in a manner or to a "purpose which was not quite the same, but was analogous "to the manner or the purpose in or to which it had hitherto "been notoriously applied (*Morgan v. Windover*), yet there "might be a valid patent, although well-known mechanical "contrivances were used, if they were applied in a manner "or to a purpose, in or to which they had not been hitherto "applied, and if the new application resulted in a new and "useful article not theretofore attained." This dictum makes merit the test of invention, where the invention is the application of an old means to a new purpose. There is more in these observations than meets the eye; and whosoever can interpret them aright may lay claim to be a pretty fair patent expert.

The Responsibility for Gas-Mains and Steam-Rollers.

AN important case further elucidating the law of liability for the condition of gas-mains and the use of steam-rollers was heard and decided by a Divisional Court on Monday of last week. It was an appeal by the Poplar Board of Works from a decision of the County Court Judge sitting at Bow, giving damages to a man named Driscoll and his wife for injuries caused by an explosion of gas in a sewer. The case will be recorded as *Driscoll v. The Poplar Board of Works*. The Driscolls were tenants of a house in the district of which the Board are the Local Authority. During a test of the drains by a rocket, an explosion occurred which was traceable to the presence of an accumulation of coal gas in the sewer. The question arose as to who was liable for this; and the sufferers took action against the Gas Company and the Local Authority. Advised that they must elect between these two possible responsible parties, the complainants proceeded against the Local Authority; alleging that the escape of gas was due to their negligent use of a steam-roller, which broke the gas-main. There was the additional consideration that the subsoil was discovered to have shrunk from underneath the main, which was consequently without proper support. All this recalls the circumstances of several similar cases. This time, for a wonder, the legal view of the responsibility for what happened exonerated the Gas Company. The judgment of the Court is worth careful perusal; and it is a source of satisfaction to know that it puts upon local authorities the responsibility for seeing, before they use a heavy roller for repairing an old road, that the gas-mains are in a condition to bear it. Unfortunately, the law of liability in this regard remains unsettled, inasmuch as this particular judgment is opposed in several important respects to that pronounced in the case of the Southwark Bridge explosion.

London County Council and Taxation of Ground-Rents.

THERE was a discussion at the last meeting of the London County Council upon a subject which must appeal to the sympathies of all ratepayers. This remarkable body is on the eve of a fresh election; and it is the "cue" of a particular party of members to play up to the popular vote. Accordingly, it has been proposed by the leaders of this party that "a new source of revenue should be "obtained by means of some direct charge upon owners "of site values." This is a new way of stating the familiar plea for the rating of ground-rents, which has struck most people as a reasonable idea in the abstract, while it has not been easy of reduction to an intelligible and equitable concrete rule. The present majority of the London County Council are not hampered by considerations of the latter kind. The circumstance of there being now in existence a Royal Commission on Local Taxation, charged with the duty, among other things, of ascertaining how far ground landlords already contribute to local taxation, is no bar to the desire of the "Progressives" of the London County Council for a popular election cry. If the policy shadowed forth by this party were to be carried into effect, every Gas and Water Company, Railway Company, and other owner of extensive lands in the Metropolitan district, would be liable to pay an extra rate in proportion to "the annual rent which at "the time of valuation might reasonably be obtained "for the land as a cleared site if let for building "by an owner in fee." When this egregious proposal was brought forward at the Council meeting, it was in vain that an amendment was moved placing the question before the Royal Commission. The framers of the scheme wanted to be able to go to their constituents claiming to be in favour of the taxation of ground values; and they wanted to fix upon their opponents the odium of taking a contrary course. It was in vain that Sir Harry Poland stigmatized the proposals as "impracticable, unfair, and "unjust." By a vote of 53 to 50, the resolution was carried; and it now remains for Sir Harry Poland and those who think with him to put into plain, unmistakable language the reasons why the proposition should be rejected by the

public of ratepayers. This is a responsibility that must not be shirked, if the other side are not to snatch a victory at the polls by professing a cause which is as plausible as it is all that Sir Harry Poland says of it besides.

"Home" Science and Literature.

THE multiplication of periodicals designed more especially for "home" reading is one of the most striking signs of the times in which we live. On every bookstall—itself a modern institution, supplanting the old bookseller's shop—one sees piles of weekly and monthly publications which by their title appeal exclusively to a class of purchasers presumed to be interested in matters affecting the "home." On the face of it, this should be a source of satisfaction to those—and they must be many—who would be disposed, on general grounds, to accept the sentiment that "the hand "that rocks the cradle rules the world." There must ever be a large proportion—perhaps a numerical preponderance—of the population of every country whose outlook on life is circumscribed by the conventional horizon of "home." To this important and mostly feminine section of the population the daily newspapers only appeal in a small degree. They are not interested in the greater part of the subjects which fill the morning and evening newspapers. They have their own ideas as to what is important and interesting in life; and this being so, it is well that they should have a special line of journalism seeking to cater for their patronage by discovering and discussing these things. It is unfortunate, and not calculated to create a favourable impression as to the calibre of the "home" reader's mind, that self-styled "home" journalism should be so poor a thing as it is in the generality of examples. To say nothing of the work of Board Schools during the last twenty years, what have the High Schools been about that there should now exist so great a demand for the most rubbishy periodical literature that was ever seen? Does any stay-at-home belonging to the rising generation now read the "Spectator," of Addison and Steele? If so, what must be the issue of the comparison of the old "Spectator" with the modern "Home Bletherings"? Of course, we know that life is now much more luxuriously and comfortably equipped with material aids than was the life of the eighteenth century; but oh! for the poverty of the intellect that seems to go with this material civilization, to judge from the popularity of the journalism which produces itself in "Bits!"

We came across recently one of the best of these "home" periodicals, in which general information is supposed to be watered down to the level of home-abiding intellect. It contained an article on "Artificial Lighting," which obligingly informed readers that "artificial lights "are required at night." This, at least, is reliable information. Again: "Artificial lighting is one of the incon-"veniences of dull and foggy weather." We should have thought that it was rather one of the conveniences of civilized life during such climatic conditions—the weather itself being the inconvenient element of existence at such times. But this is, of course, only carping criticism. It is possible to agree with the apparent meaning of the remark, as to town fogs, that "the impurities which are derived "from imperfectly burnt coal, which are present in such "a moisture-ladened [*sic*] atmosphere, make it unhealthy "for all alike, young and old, as well as the delicate and "strong." It is only too true. However "delicate and "strong" we may be, we bar fogs! The writer of this effusion has more sense than style. While admitting a preference for electric lighting for interiors, he points out that "it does not follow that the air in a room which is "lighted by electricity is purer than in one illuminated "by means of some burning substance." Far more pretentious writers have failed to make this point. The article exhibits a curious mixture of knowledge of the principles governing the combustion of illuminating substances, such as gas and oil, and lack of common sense. Thus, the rate of consumption of the ordinary types of gas-burners and the results of their use are stated correctly; but following upon this is the observation that "what-"ever form of burner is used, it is necessary to provide "some ready means of exit for the harmful gases which are "produced by the consumption of coal gas. . . . For "this purpose a funnel-shaped mouth placed above the "gas-jet, provided with a pipe, which opens either into "the smoke-flue or directly into the open air, answers "very well." Did the writer ever see such an arrangement in a domestic interior? Of such is the quality of the popular, or "home," science of the day.

WATER AND SANITARY AFFAIRS.

AT the second sitting of the Royal Commission appointed to inquire into certain matters connected with the London Water Supply, held at the commencement of last week the proceedings began with a most important declaration from the Chairman, who announced that the Commission had decided not to reopen the questions reported upon by the Royal Commission presided over by Lord Balfour. This is so much clear gain in the progress of business. Part of the race is already run; and the new Commission starts where the old one left off. The existing water supply of London is declared to be good and adequate. Having thus shut the door against the intrusion of a subject already dealt with, Lord Llandaff proceeded to give a further hearing to Mr. H. L. Cripps, who seems quite capable of taking a whole Commission to himself. As the Parliamentary Agent of the London County Council, he overflows with history and statistics on the subject of the water supply, and makes discoveries among the statutes such as serve to excite a feeling of surprise and perhaps of scepticism on the part of Lord Llandaff. Mr. Cripps discerns "the principle of competitive powers of supply" everywhere; but he fails to show where it is actually in operation, and has finally referred the Commission to Sir Alexander Binnie for further information. Leaving this favourite topic, Mr. Cripps plunged into a mass of old parliamentary proceedings, in support of his contention that the London Water Companies had not fulfilled some pledge which they gave more than forty years ago. After listening awhile, the Chairman quietly remarked that if the Commission found the contention was not borne out, they would think their time had been a little wasted. Following this came something of a more refreshing character, in the shape of a personal opinion from Mr. Cripps that the transfer of the undertakings of the Water Companies to the County Council by means of purchase "was the only way of finally settling the London "Water Question." This was a lift for the Royal Commission; but the Chairman saw fit to lead Mr. Cripps away into the "various areas" outside the Metropolitan boundary, where "some sort of agreement" had been attempted by the County Council. In that outer region Mr. Cripps found he had something to learn. He was not aware that the authorities of Middlesex wished to be "left "alone," or—as stated by the Chairman—that the latest decision of the County Councils of Kent and Surrey was that purchase is not desirable, having regard to all the circumstances of the case. But the most critical point of all was that Mr. Cripps would split up the Metropolitan area under five, if not seven, Water Authorities, in place of the eight Water Companies as now existing. Lord Llandaff suggested to Mr. Cripps that this would surely be "sacrificing all the advantages of concentration" which he had put forward. Mr. Cripps thought not. Whereupon the Chairman rejoined: "You think a division by "five is wholesome, but a division by eight intolerable." This is a fair presentation of the case, except that the original scheme of the County Council prepared the way for further divisions in the outer areas, as remarked in these columns at the time. As for the evidence and the pleadings of Mr. Cripps, the result of this gentleman's appearance before the Commission has been to bring out more clearly than ever the fallacies lying at the root of the Council's pretensions in respect to the water supply.

The interesting and comprehensive address delivered by Mr. Frederick Tendron, in presiding over the half-yearly meeting of the Grand Junction Water Company last week, deserves to be read, and carefully studied, by all who take an interest in the water supply of London, and even of towns in general. The financial part conveys an important lesson, as showing how a London Water Company can contentedly submit to a reduced dividend in order that the supply to the consumers may be rendered secure against all the contingencies of drought and frost. The expenditure of capital in carrying out the Staines reservoirs scheme entails a heavy charge, which proves to be even greater than was originally reckoned upon. A large outlay is also being incurred in the process of lowering the mains, so as to prepare for the possible recurrence of such a phenomenal frost as that of 1895. It would appear that the consumers are less anxious on this point than the Company, judging by the extent to which they leave their communication-pipes at the mercy of the weather. While

consumers remain inert, the Company go on duplicating mains, increasing engine power, and largely extending the area of their filter-beds. No doubt the shareholders will ultimately reap the benefit of so spirited and judicious an outlay; but in all probability neither Parliament nor the Press will be found ready to recognize the extent to which the public have been benefited by the enlightened policy which the Directors have carried out. It was natural that Mr. Tendron should refer to the extraordinary course pursued by Mr. Idris, in declaring that London was liable to even worse consequences than Maidstone in respect to its water supply. This was a gentleman, as Mr. Tendron remarked, who ought to know something about the subject, judging by his position on both the London County Council and the Thames Conservancy Board. But in reality Mr. Idris needs to be reminded of the proverb that those who live in glass houses should not throw stones. As the head of a firm of mineral water manufacturers, his attention is now called to the fact that Sir W. Crookes and Professor Dewar have analyzed certain aërated waters, stated as bearing the Idris trade mark, and have found 56 microbes per cubic centimetre in soda water, 1674 in potash water, and 250,000 in seltzer water. This has to be compared with Grand Junction water containing 14 microbes per cubic centimetre, or little more. The Grand Junction gnat thus stands comparison with the Idris camel; and if people can swallow the latter, they certainly need have no fear of the former. It is also a little odd that another member of the Conservancy Board—Mr. M'Dougall—who is devoted to temperance principles, should take the same course as Mr. Idris, and thereby discourage the working man from adopting water as a beverage. But, as Mr. Tendron remarked, there is a scheme for getting water from Wales; and hence the attempt is made to show that Lord Balfour's Commission was altogether wrong in giving the water supply of London an unexceptionable character. Perhaps we may suggest that anyone partial to a Welsh supply should resort to seltzer—henceforth to be known as Cader-Idris.

The Subject-Paper of The Gas Institute.—We are informed by the Secretary of the Incorporated Gas Institute (Mr. Walter T. Dunn) that a revised list of subjects on which papers are invited has been prepared by the Council, and that he will be pleased to forward a copy to any member of the Institute on application.

Acetylene v. Electricity for Lighting Buoys.—According to "Electricity," of New York, a number of experiments are being made by the United States Lighthouse Board to ascertain the advantages, if any, of acetylene over electricity for the lighting of buoys. It is claimed that acetylene gives a more suitable light than the arc lamp; and that the gas-buoy can be manufactured for one-third of the price of an electrically-lit buoy and its appurtenances. The acetylene flame, however, would cost 7·5c. per hour; whereas the expense of generating and delivering current to an arc lamp would not, it is said, be more than 3c. There would, in addition, be the trouble and cost of charging the acetylene buoys.

Gas-Engines in Chemical Works.—At the meeting of the Manchester Section of the Society of Chemical Industry on Friday, the 3rd inst., Dr. F. H. Bowman contributed a paper on "Steam, Gas, and Electrical Energy as applied to Chemical Works." Describing the results of his personal experience, he said that the steam-engine was a very wasteful machine, but it had so many advantages that, except under particular conditions, he feared that for a very long time they would have to rely upon it in chemical works. The gas-engine was too complicated and intricate for the rough work of a chemical factory; but where power was required for the production of an electric current, and there was a supply of producer or water gas available, there was no doubt that the gas-engine was a most efficient and economical method of obtaining it.

A New Concrete Mixer.—An improved horizontal continuous-discharge concrete mixer was described and illustrated in a recent number of the "Engineering Record." It was designed primarily to meet special demands for a compact, inexpensive means of making and placing concrete in fireproof buildings. It consists of a steel and iron trough with a steel shaft revolving in its centre, with suitable knives arranged so as to be easily renewed, and driven by a vertical engine by means of spur gearing. The friction-drum hoist is driven from the same engine and gearing; and the mixer can be easily disconnected. The hoist is complete in itself—being fitted with foot brake with ratchet and pulley—and is used for hoisting and distributing the mixed material on the various floors of the building under construction. A boiler can stand on the same frame, for furnishing steam; or it can be placed outside the building to prevent the usual dust and smoke.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1302.)

Business on the Stock Exchange still continues very restricted, although there certainly was a little more animation last week in some quarters, mostly of the speculative class. The general tendency was somewhat fluctuating and uncertain, where special influences to direct a well-marked line were wanting. The removal of apprehension that we might be in for a Christmas railway strike cheered the Home Market; and that department, with Consols and similar choice articles, was much in demand. Prices, on the whole, are better; but there is no very striking feature. The Money Market is as firm as a rock, and seems bound to remain so with a probable good demand this week. In the Gas Department, business was rather quieter than in the preceding week; and movements were few and slight. They were also irregular; there being just as many in the one direction as in the other. The prevailing tendency, however, was rather in favour of slightly reduced prices. In Gaslights, the "A" was less dealt in than in the week before; and it continued to show weakness. The opening price was 316, from which it slowly stepped down, till on Friday it marked 313¾; but on Saturday it closed with a bargain at 315. The quotation showed a loss of two points. There was a fair demand for the secured issues, which fetched very good prices; the 10 per cent. preference in particular repeatedly commanding the top quotation. South Metropolitan changed hands steadily all through the week at 145½; but as it could not go up, it went down a point in quotation. Commercials displayed a little more activity than of late; but prices were only moderate. While in the market the new stock with the accruing dividend on it was being marked at 256, a portion of the same issue, sold by order of the Directors at the Mart on Monday, fetched 261, though it will receive no dividend until next October. This is by no means an isolated case as our readers know; and we think it is high time that the market took heed of it. If there is to be one set of prices in the market, and another in the Mart, it is only natural that sellers should select the best; and buyers, of course, must go where stock is to be bought. The Suburban and Provincial division was quiet and unchanged. The Continentals were active and strong generally; and European marked a rise. None of the rest moved, except Australian debenture, which rose a point. Business in the Water Department was as calm as usual, with a firm tendency. Lambeth advanced; and Southwark also gained a point in view of a return to a 6 per cent. dividend.

The daily operations were: Business in Gas was rather quiet on Monday; and the only change was a rise of 1 in Australian. A little more animation prevailed on Tuesday; but nothing moved. In Water, Southwark ordinary, and ditto "D" rose 1. Wednesday was more active generally; but Gaslight "A" was quiet and fell 1. European part paid gained ½. In Water, Lambeth rose 2. Business was slack again on Thursday; and Gaslight "A" fell 1 more. Friday's transactions were no heavier, and South Metropolitan fell 1. Saturday was extremely quiet; and quotations closed unchanged.

ELECTRIC LIGHTING MEMORANDA.

The Burden of Dublin—Dr. Kennedy Advises—When are Renewals not Renewals?—Loss on Electric Lighting at Salford.

Some time ago it was remarked in this column that when interested persons found it expedient to look up examples in proof of the paying character of municipal electric lighting enterprises, they never mentioned the case of Dublin. Yet "the practice of Dublin" in respect to one very important aspect of municipalized electric lighting was cited readily enough at one time by the St. Pancras Electric Lighting Committee and other local authorities. For it was Dublin that originated the ingenious theory that the sinking-fund payments of local authorities, in regard to their electric light loans, represented all the necessary allowance for depreciation. This was a mighty convenient theory for St. Pancras and other localities similarly situated in not having enough money to spare out of electric lighting revenue to set aside the depreciation allowance contemplated in the scheme of the new venture. Dublin hit upon a way of screening the failure to comply with this condition of solvency; and Dublin has been the first to go to the Local Government Board with the confession that the screen has broken down. There is a fine flavour of poetic justice about this situation; but the enjoyment to be derived from contemplating it is neither satisfying nor long-lived. We, at any rate, do not take pleasure in crying "I told you so!" when a catastrophe which we have seen to be in preparation falls at last upon a deceived community. As Dublin is, so will several other localities be in the fulness of time; and the pity of it is that the punishment will fall upon the innocent. Such is the way of the world; but we believe that if some of the leading men in communities tempted to embark in some speculative venture, as electric lighting must be in nine places out of ten, would only pause and ask themselves who will profit by their consenting to

the enterprise, and who will suffer if it proves a failure, they would hesitate to make the plunge.

Dublin, having shut its municipal eyes to the necessity of providing for the depreciation of the public electric lighting plant, was rudely awakened from its "Fool's Paradise" by the hard fact of more and more frequent breakdowns of the service. The Corporation found themselves confronted with the prospect that unless something were done, and that quickly, such electric lighting business as they had would be taken from them. Thereupon they went to the Local Government Board for a fresh loan—only a poor £20,000—to put the plant in order withal. To their sore dismay, the reply of the Local Government Board to this application was to the effect that the Board had no power to grant a fresh loan for renewing plant purchased out of loans still running. But this was not all. In order to cover up the financial and material failure of their first electric lighting works, the Corporation had a mind to embark upon a more grandiose scheme, of the nature discussed in our "Memoranda" on Oct. 19. We then remarked that the whole question ought, in justice to the ratepayers, to be submitted to an expert of the first rank. It is to the credit of the Corporation that they took this course, and called in Dr. A. B. W. Kennedy, who, we learn, has not been able to commend the larger scheme in the form in which it came before him. It is further understood that Dr. Kennedy has advised the Corporation that their existing central station can never pay, and is reporting on the general subject. This report, if it has yet been sent in, has not been published.

Meanwhile, the sorely-tried Corporation have been constrained to make a complete change of front in their way of approaching the Local Government Board for that £20,000 loan. The money was wanted for renewals; and so notoriously was this the case, that when the Local Government Board's Inspector came to hold the local inquiry, the "Freeman's Journal" report of the proceedings was headed with the statement that the proposal of the Corporation was "to borrow the sum of £20,000 for the renewal of the cables used for the electric lighting of the city." Yet the Counsel for the Corporation was instructed to declare to the Inspector that "the work proposed to be done would be all new," and the Electrical Engineer to the Corporation was also fain to testify that the loan applied for was required for the execution of "new works." Nobody could say, however, that the works in question would be "additional" as well as "new." There was no denying the fact that the money was to be laid out upon new cables to take the place of the old; but it was attempted to be shown that the old ones would come in useful for the new and extended scheme. This was a very thin excuse; and more stress was laid upon the intention of the Corporation, by the advice of their present Consulting Engineer, to change the whole system. This, however, only shifts the difficulty without removing or lessening it; for if a change of system for doing the same thing is not "renewal," what is it? Unfortunately, the major fact remains that the Dublin Corporation are in great difficulties with their electric lighting. Those of our readers who wish to refresh their memories as to the manner in which Dublin was involved in this trouble in the first place will find the information in our passing references to the subject in the volumes for 1891. It is unjust to ratepayers to "let bygones be bygones" in this matter of electric lighting speculations. It is no business of ours to do it; but if some of our electrical contemporaries who go in for electric lighting statistics would compile a list of the undertakings commended and carried out by different electrical engineers, whereby what may be termed, without disrespect, the "public form" of these gentlemen could be seen at a glance, the local authorities would know better than they do whom to trust.

Another place the partisans of municipalized electric lighting do not care to talk about is Salford. There is no denying the fact that Salford has done very badly. Why this should be is not obvious. Our usually fair contemporary, the "Electrical Review," has thought fit to ascribe the result to the circumstance of the electricity supply works being put in the first place under the Gas Committee, and the Borough Electrical Engineer made subordinate to the Gas Engineer. This arrangement is characterized as "stifling" the Electricity Department. But if our contemporary had considered the point a little more, it would have remembered that many a corporation electric lighting undertaking has been "nursed" in infancy by the Gas Department until such time as it was thought able to stand alone. Some other explanation of the trouble of Salford is required to supplement that which would ascribe it all to the jealousy of a malignant dry-nurse. We have looked into the subject, and have arrived at the conclusion that the Salford central electric lighting station does not pay primarily because electric lighting is not wanted at the price. There is too little demand for the electricity, with the result that the expenses are nearly double the revenue. A reason for this is found by critics of the management in the high price charged per unit under the orders of the Gas Committee, who regarded the service as a luxury. There is something in this; Salford being at the top of the "Electrician's" list of municipalized undertakings for price received per unit. By all means let the price be dropped to a more reasonable figure, and then see how the more liberal policy works. The Corporation could not lose much more if they were to give current away for a year. Until something like this has been done, it will be impossible to say definitely whether the undertaking is a superfluity or not. An attack has been made locally upon the Gas Committee because they took expert advice upon the design and development of the electric lighting plant—surely, a gratuitous complaint. We notice that one of the complainants in a local paper asserts that in the case of almost every other Municipality who have undertaken the supply of electric lighting the working has proved financially successful. This is vastly too much to say; but it may be conceded that Salford is exceptionally badly off. Whether it will ever be in any better case is another question.

WELSBACH INCANDESCENT GAS-LIGHT COMPANY, LIMITED.

In another part of the "Journal" will be found the prospectus of the above Company, the formation of which has been already referred to in our columns. It represents the amalgamated undertakings of the Incandescent Gas-Light Company, the two Austrian Companies, and the Irish Company, which Companies, with the English Incandescent Gas-Share Company, Limited, will be dissolved. The capital, as stated in the preliminary circular noticed in our issue for the 16th ult., is £3,500,000, in 300,000 5 per cent. cumulative preference shares of £5 each, 1,350,000 ordinary shares of £1 each, and 650,000 deferred shares of like nominal value. The present issue is 227,435 preference and 987,175 ordinary shares, for which applications will be received from Thursday morning next till four o'clock the following day. The effect of the amalgamation is to do away with certain very onerous arrangements, increase the working capital, and give the new Company the control of the Vienna Company's business, including the factory where the fluid now so largely supplied in England and on the Continent, as well as in India and Australasia, is manufactured. The great popularity of incandescent gas lighting in Great Britain alone is evidenced by the fact that, whereas in the year ending March, 1894, the Incandescent Gas-Light Company sold only 104,278 burners and mantles complete, and renewed 178,246 mantles, in the twelve months ending last March the numbers were 929,176 and 3,096,627; the total number for the four years being 1,907,401 burners and mantles and 5,642,258 renewals. With regard to the scope of the Company's operations, it is believed that there are in the United Kingdom upwards of 200 million gas-jets in use; so that not 1 per cent. of the business that might be done has yet been reached. Apart from this, an oil-lamp for use with incandescent mantles will shortly be placed on the market; thus bringing the advantages of the Welsbach system within the reach of the residents in districts where gas is not obtainable. The books and accounts have been examined by Messrs. Deloitte, Dever, Griffiths, and Co., who certify that the net trading profits for the last completed financial year amounted to £209,808, while only £169,500 will be required to pay a dividend of 5 per cent. on the preference, and of 7 per cent. on the ordinary shares. The new Company will be under the control of a strong administrative body. The Chairman is Sir Henry C. Burdett, K.C.B., who till recently filled the important position of Secretary of the Share and Loan Department of the Stock Exchange; Major-Gen. George de la Poer Beresford, the Chairman of the Incandescent Gas-Light Company, is the Vice-Chairman; and among the other Directors are Mr. Julius Moeller and Mr. L. R. de Fonblanque, whose connection with that Company, as Managing-Director and Secretary respectively, is well known. The present Assistant-Manager, Mr. G. A. Gutch, will (*pro tem.*) discharge the secretarial duties.

In noticing this further step towards the development of the business of incandescent gas lighting, it may not be out of place to quote the introductory portion of an article on the amalgamation which appeared in the "Financial News" last Thursday: "It is seldom that the history of a commercial undertaking presents such a record as that of the Welsbach Gas-Light Company. When the first patent was taken out, in 1885, the Company was in a struggling condition. It was with difficulty that those who had so often come to the rescue were prevailed upon even in 1893 to find the few thousand pounds necessary to develop its business. Even then it was only by an extraordinarily generous offer that shareholders were induced to find more funds; 2s. preference shares being issued, which were entitled to no less that nine-tenths of the future profits of the Company. At the time we refer to, one of the old shareholders wrote out his cheque for 5000 of the 2s. preference shares, and, together with the application form, put it in his letter-box in his hall. Before the letter was posted, he altered his mind, and took the missive back from the box, tearing up the cheque. The investment of that £500 would now have been represented by a market capital value of over £200,000."

British Association of Water-Works Engineers.—We learn from the Secretary of this Association (Mr. W. H. Brothers) that the winter meeting will be held in London in February next, when a paper will be read by Mr. H. W. Pearson, M.Inst.C.E., M.Inst.M.E., Engineer of the Bristol Water-Works, on "Springs and Wells for Town Supplies, and Works in Connection with Same." At this meeting there will be an election of members and associates.

THE MANCHESTER CORPORATION AND TECHNICAL EDUCATION.

During the past summer the Technical Instruction Committee of the Manchester Corporation deputed certain of their members, with Mr. J. H. Reynolds, the Director and Secretary, to visit technical schools, institutions, and museums in Germany and Austria. The object of the deputation was to find out how such things are managed on the Continent; and the reason for this information being desired was that the Corporation have undertaken the responsibility of maintaining the Technical and Art Schools of the City. In pursuance of this obligation, they have in course of erection the largest technical school building in the country, the proper equipment of which is a matter of most serious concern. It was very properly felt by the Committee to be the height of unwisdom, having regard to their responsibility for providing this equipment, that anything should be done in the matter without taking account of the state of contemporary Continental practice in this regard. Happily, in the pursuit of knowledge which all nations now admit to be one of the main things needful for securing future prosperity, there is no jealousy one of another. Consequently, the Manchester deputation had only to go to Germany and Austria to be welcomed by those who are occupied in ransacking all the resources of science in their endeavour to compete with Manchester in trade. They went far and saw much; and their observations are recorded in brief in a report, with a copy of which we have been favoured. We say advisedly that this report, which is signed by Alderman James Hoy, on behalf of the Committee, is a brief summary of the itinerary and observations of the deputation; for it is all contained in a pamphlet of seventeen pages, whereas a portly volume might be filled with what the members of the deputation thought of all they saw and heard, to judge from the emphatic speeches in which they commended their report to the notice of the Corporation and the citizens.

One of the principal subjects which the deputation had in their minds to inquire into was applied electrical science; and the other was the textile industry in its various departments, in some of which Manchester has confessedly fallen behind. The fact here appears to be that Continental nations were comparatively early in grasping and applying the truth that knowledge is not merely power, as the copy-book hath it, but is also trade, and profit, and commercial advantage in every respect. In England the general rule has been for the works to be at the same time the school, and the only one, for those who follow the trade, whatever it might be. On the Continent, the process of separating instruction from execution has been long in operation. We in England are only just coming to see the expediency of the severance. Yet it should not have taken a practical people so many years to perceive that the factory or the workshop can never be a school in more than an imperfect and strictly limited sense. As a speaker at this year's London Conference on Technical Education remarked, the primary object of a factory is to make money, that of a school is to make men. Hitherto the imperfection of the British system has been masked by the exceptional quality of the men concerned and the favourable conditions under which British trade was carried on. There was no division of interest between the workers and their employers; and other nations were so backward industrially, or so much engrossed in fighting among themselves and upon each other's territories, that all were bound to come to England for most manufactured goods. If the rest of the world wanted not merely manufactured goods but also railways, ships, water-works, and gas-works, they had to come to England for them. And English workmen went everywhere and did everything, according to the promptings of their unequalled mechanical instinct and the requirements of the job.

All this has been changed. The foreigner does not fight his neighbour, and his armies are in a great measure schools of order, discipline, and progress. He makes most things for himself; and he only takes our raw material, which is usually coal, when he buys of us at all. Moreover, there are many things in which he is able to teach the Englishman. Quite recently, to speak only for our own industry, we published an article showing how greatly the gas industry, which was born and developed in England, is indebted for modern improvement to the foreigner. Worst of all, the British workman and his employer no longer see eye to eye. The master cannot rely upon his workpeople doing their best for the trade by which he and they live. They have acquired the notion that their interests are not only different from, but are diametrically opposed to, his; and the consequence is that he cannot expect any help from them in developing his business. So far as the working classes have been "educated," their trade interests have not equally benefited. Their condition has been improved in most respects, but not their loyalty to their salt. The consequence of this is that the essentially democratic system of training all workers, masters as well as men, in shop and factory together, must be given up. Somebody must see to it that industry and trade go on improving in methods and results. If the workpeople do not care for these things, the masters must look to it themselves. The Mechanics' Institute that produces the socialistic Trade Unionist must be matched, and overmatched, by the National and Municipal Technical Institution where the managing class can equip themselves for the struggle of industrial life with all the resources of science and art.

It appears to us that this view of the new movement for placing the technical school before, and in a sense above, the works is not sufficiently understood in its social aspect. It is essentially of an aristocratic character, and will result in the creation of a type of manager altogether different from the old works' foremen, who all rose from the ranks as a matter of course. It has not occurred to observers of the progress made by Germany and Austria in this matter of superior technical instruction, that the aristocratic systems which regulate life in those countries develop naturally in this way. The German workman never had much chance of rising beyond the grade of a drudge. He has less now. The British workman was once as good as his master. He has chosen to take his own line; and the master, who is by no means disestablished, is taking his—which leads him, in the first place, to school, and keeps him there while the son of the workman is compelled to earn his daily bread. This sounds a harsh saying; but it is the truth, and it is useless to blink it.

What it amounts to is this: The son of the mechanic will go through his apprenticeship, or what corresponds to it, pretty much as of yore. Meanwhile, if he chooses, he will be able to attend evening schools where as much further instruction as he can or cares to assimilate will be at his disposal. This latter advantage was more than the wealthiest employer's son could command a generation ago. Meanwhile, the son of middle-class parents whose tastes and aptitudes lead him that way, will be learning at the Technical School not exactly how things are actually done in the works or the factory, but rather how they should be done according to the scientific standard. This standard may not be the same as that of commercial expediency and advantage; but unless the student is a fool he will soon learn, on leaving school, how to establish a mean between the two standards, with a constant tendency to bring up the lower to the higher. Of course, just as the young apprentice will not always make the fullest possible use of his advantages —will rather, in the great majority of instances, make no use of them at all—so the higher-class student will frequently fail to reconcile the great verb "to know" with the still greater verb "to be able;" but he will have his chance.

What Germany and Austria are doing, not for the workman but for his superiors, is indicated in the Manchester report. The Governments of the countries know what they are about. They are not spending money in "popularizing" technical and scientific instruction, in the fashion dear to people like that wiseacre of the London County Council who on a certain occasion dilated on the splendid advantage it must be to a bricklayer to be acquainted with the chemical composition of the bricks he is employed to lay. The report notices that the facilities provided by Prussia for the culture of technical excellence are intended for a public fit, and therefore necessarily few. Attention is specially drawn to the fact that "these splendidly equipped special schools are intended to accommodate only a small number of day students. These, however, are the men who for the most part will be the 'brains' of the industries into which they will shortly enter as foremen, managers, or employers." The standard of general education of these students is also exceptionally high, which struck the deputation as "surprising"—one would like to know why.

The subject of electrical engineering has already been mentioned as one which particularly interested the deputation; and it serves remarkably well for an example of how a Continental Government has understood its responsibilities in the matter of technical instruction. Applied electricity is supposed to be one of the keys of the industrial treasures of the future; and in 1895 Darmstadt made up its mind that instruction in the subject should be one of the special features of its new Technical High School. Now, Darmstadt is the name of a city of 57,000 inhabitants, and of a State the entire population of which numbers scarcely more than a million. Yet this State spent £130,000 on the buildings of its Technical High School, and maintains the institution upon a scale which the Manchester deputation despaired of approaching "either in extent or completeness, for want of space and want of means." Then there was Dresden, with its Polytechnic, which provides special accommodation for "coal-tar colour laboratories." Stuttgart and Hanover are also well to the fore with physical, chemical, and electrical laboratories on an imposing scale. From all this evidence it is deduced "that the educational advisers of the various German Governments are of opinion that the same success which has already attended the establishment of numerous and costly chemical laboratories in stimulating German industry, and placing the nation first in the manufacture of chemical colour products, will be repeated through the establishment of like laboratories for the study of technical electricity as applied to the field of chemistry and to engineering." The English of this statement is a trifle shaky, but the sense is solid enough.

The Manchester deputation were much impressed with the co-existence with the German technical schools of enormous industrial establishments, such as the Badische Anilin und Soda Fabrik, and Messrs. Schuckert's electrical engineering works. Germany is prospering, industrially and commercially. Of this the deputation entertained no doubt; and they saw positive proofs of it in the extension and improvement of the towns. They formed the opinion that the new schools are at the bottom

of this surprising industrial development, and are the main contributors to the economic result. "It is no less certain that if we are to maintain our position as a great industrial community, it must be by following and adopting the same methods." In regard to the engineering industry, the deputation found that Germany and Switzerland are coming to the front, "to our serious loss and permanent injury as a manufacturing and commercial nation. The command of electrical power, cheaply developed and readily distributed, and the widespread introduction of automatic tools and appliances, and better workshop organization, are working a silent but sure change, to the great advantage of these countries in equalizing the conditions of the industrial struggle with Great Britain, especially having regard to the ample supply of labour at a lower cost in the working of automatic machinery."

The experiences of the Manchester deputation were, to express the fact in colloquial language, an "eye-opener" for more than one of the members who took part in the pilgrimage. In presenting the report to the City Council, Alderman Hoy laid particular stress on the proof it supplies of the strenuousness of the efforts actually being made by the chief Continental nations to provide the highest scientific training for those who are ultimately to become the leaders and organizers of the great scientific industries. What the speaker meant to impress upon his hearers was that Germany, for so long the nursing mother of Universities of the older order, has become in these days the home of Universities of quite a new type. Heidelberg and Göttingen are not extinct; but they are paralleled by Stuttgart, Darmstadt, and Hanover. Most remarkable testimony to the mechanical progress of Germany was offered by Mr. Phythian, who admitted that, "as a member of the Amalgamated Society of Engineers, he went upon the deputation with a prejudiced mind." He had the traditional idea as to the essential superiority of the British workman to the foreigner; but he left this delusion behind him. "He found also that the Continent was realizing considerable benefit as a result of the deplorable dispute in our engineering trade;" thus anticipating the recent disclosures made by Mr. Gilbert Little in our "Correspondence" columns.

It now remains to be seen what the Manchester School will be like. If it is at all equal to the conceptions brought home by the Corporation deputation from Germany of what is desirable in an institution of the kind, it should be no discredit to the city. More than this it would only be courting disappointment to expect.

OBITUARY.

Mr. H. J. Baugust, who for many years has served the Castle Donington Gas Company in the capacity of Secretary, has been removed by death. He only retired from the office about a fortnight ago, through impaired health, and died a few days later.

The death is announced of Mr. C. H. Read, of Wickham Market, on Monday last week. He was one of the chief promoters of the local Gas Company, and for several years filled the position of Manager, piloting the Company through many vicissitudes.

The South Shields Gas Company have lost one of their most active Directors by the death of Mr. Banford Williamson, J.P., which took place on the 5th inst. The deceased gentleman, who had reached the ripe age of 72 years, had been in failing health for some time. Until about a year ago, he was also a Director of the South Shields Water Company.

PERSONAL.

Mr. George Ryle has been appointed Secretary of the Castle Donington Gas Company in succession to Mr. H. J. Baugust, whose decease is recorded in our "Obituary."

Mr. Thomas Hulme, who has been Chairman of the Gas Committee of the Burslem Corporation during the last fifteen years, has found it necessary to retire on account of failing health. The Committee have placed on record their great appreciation of his services.

Mr. Charles J. Hobbs has resigned his appointment with Messrs. James Simpson and Co., with whom he has been for upwards of twelve years, and joined the Hydraulic Engineering Company of Chester, who purpose largely developing their present water-works business, and are making special arrangements to this end.

Mr. Harry Shepard, the Chairman of the Wellington (Salop) Gas Company, has been placed upon the Commission of Peace for the county. Mr. Shepard has resided at Wellington nearly all his life, and has taken great interest in the public affairs of the town. He was for some years one of the Wellington Commissioners, and on two occasions filled the position of Chairman of that body.

Mr. W. Liddall, the Secretary of the Ascot Gas Company has decided, owing to failing health, to sever his connection with the accountancy profession. The business, which has hitherto been carried on under the style of Messrs. Liddall, Reeve, and Co., will therefore in future be conducted by his present partners; the title of the firm being Messrs. Reeve, Parker, and Co.

On the recommendation of the Water Committee, the Sheffield City Council have raised the salary of Mr. Leonard S. Marsh, their Resident Engineer, by £100 per annum. At the time of the reorganization of the work of the officials of the Department early this year, it was proposed that Mr. Marsh's salary should be £600; but an amendment was then passed placing it at £500. The Council have thus within the first year's working under the new arrangement seen the justice of the Committee's previous recommendation.

The services rendered during the past twenty-two years by Mr. W. Duff, the Manager and Secretary of the Morecambe Gas Company, to the Morecambe Lodge of Freemasons, of which he has just relinquished the secretaryship, after holding it for fifteen years, were acknowledged by the brethren at the installation meeting of the Lodge on the 3rd inst., when he was presented with a solid silver tray, suitably inscribed, as a mark of their esteem. The presentation was made by Bro. Captain Garnett, P.M., P.P.S.W., who spoke of the high qualities of Bro. Duff, and expressed the hope that he and his wife would live long to use the tray as freely as it had been subscribed for. Bro. Duff briefly thanked the brethren for their gift.

It may be remembered that we recently announced the award by the Royal Humane Society of medals and certificates to Mr. T. B. Walker and Mr. H. Perrin, for the bravery displayed by them in endeavouring to save the life of the Assistant-Manager of the Wrexham Gas-Works (Mr. S. B. Hesketh), who was suffocated by an escape of gas on the 24th of October. The awards were presented a few days ago by the Senior Director of the Company (Mr. W. Overton) and the Chairman (Mr. J. Oswell Bury), in the presence of the Directors and the whole of the workmen; both the recipients being highly complimented for their heroic conduct. Mr. Walker, in returning thanks on behalf of Mr. Perrin and himself, modestly disclaimed the idea that there was anything extraordinary in their action. They had, he said, simply done their duty, and would willingly risk their lives again under similar circumstances.

At the monthly ballot for membership of the Institution of Civil Engineers on Tuesday last, Mr. J. H. Darby and Mr. J. Mactear were admitted as members; Mr. J. Tysoe was transferred from the class of associates to that of members; and Mr. J. T. Rodda and Mr. W. Arthur Valon were admitted as associate members. Mr. Darby's name will be remembered by our readers in connection with the Semet-Solvay coke-ovens which he has erected at the works of the Brymbo Steel Company, Limited; Mr. Mactear is associated with the Incandescent Gas-Light Company; Mr. Tysoe is the Superintendent of the East Greenwich station of the South Metropolitan Gas Company; Mr. Rodda is the Outdoor Inspector to the Eastbourne Water Company; and Mr. Arthur Valon, as mentioned in the "Journal" a few weeks ago, was one of the few candidates who successfully passed the first examination held under the new rules of the Institution in October last.

The "Richmond" Cookery-Book.—The name of Richmond has already become a household word in connection with the production of all kinds of stoves for the utilization of gas for culinary and general domestic purposes; but it now comes before us in association with the all-important work performed by the appliances comprised in the first-named category. Under the title of "The 'Richmond' Cookery-Book," Miss Lillie Richmond, a Gold Medallist and First-Class Diplomée of the North Midland School of Cookery, has published a useful collection of domestic and economical cookery recipes, accompanied by some special hints on cooking by gas. There are, of course, plenty of similar works; but Miss Richmond's special endeavour has been not only to suit the tastes and requirements of all classes, but to make her book so simple as to be useful in every household. We think she has succeeded. The recipes, which are freely illustrated, occupy 252 pages of letterpress; blank leaves being inserted for MS. additions or notes at the end of each section of 16 pages. The book is of convenient size, neatly bound, and furnished with an index.

The Electric Light and Eyesight.—The facility for a fuller investigation of physiological questions which has been afforded by the discovery of the Röntgen rays has led to increased attention being given to the influence of the electric light on the eyesight. We have already had occasion to refer to the effect on the eyes of sailors of the brilliant lights now used on shipboard. It appears that grey and blue eyes are the most liable to injury, as they are not heavily charged with pigments. The men who work the searchlights already wear dark-blue glasses; but it is found that these only mitigate the intensity of the light, and do not absorb the real source of the trouble—the ultra-violet rays. These rays, however, can be intercepted by "goggles" or screens of uranium, on yellow glass; and with these, it is understood the sailors of the French Navy are soon to be provided. Dark glasses are now used by all the men on the electric drilling shifts. A singular feature of this affection is that it is analogous to snow or desert blindness; and, as in that case, the pernicious effects of the electric light are probably due to the ultra-violet rays of the spectrum.

NOTES.

Pear-Shaped Glasses for the Incandescent Gas-Light.

Dr. Max Rosenfeld describes in the "Zeitschrift für Beleuchtungswesen" a pear-shaped glass intended to serve as a substitute for chimney and globe with incandescent gas-burners. It is made under patent rights by a Berlin firm; and, according to Dr. Rosenfeld, it has a far more artistic appearance than any combination of globe and chimney. Ventilation is afforded by a circle of holes near the top of the glass, which resembles in shape the pear-like bulbs of electric glow lamps. The glass is frosted to diminish the glare of the light; and suitable frill and saucer-like glass screens can be applied to hide the burner parts. It is stated that the new glass will prove a powerful auxiliary to the incandescent gas-light in its competition with electricity for the artistic lighting of rooms. It is adapted for use with the ordinary Welsbach mantle; but, naturally, it can only be employed in an upright position.

Action of Nitric Oxide on Acetylene.

Some interesting experiments on acetylene, described by S. Zinno in "Luce e Calore," are referred to in the "Chemiker Zeitung." If dry nitric oxide is led into water in a Woulff's bottle, and as soon as the air is expelled from the bottle acetylene is introduced along with the oxide, the water will be found, after the mixed gases have passed through it for some time, to contain cyanic acid, as well as nitric and nitrous acids. Apparently the cyanic acid arises in conformity with the equation—

$$C_2H_2 + 2\,NO = 2\,CNOH$$

If the mixed gases leaving the Woulff's bottle are cautiously ignited at a suitable orifice, they furnish a flame of extraordinarily high illuminating power, far exceeding in brilliancy that of acetylene alone, provided the acetylene is in excess in the mixture. If, however, the nitric oxide is in excess, the flame has a red colour; and the mixture explodes and shatters the bottle with great violence.

The Strength of Wooden Beams and Columns.

At a recent meeting of the Engineers' Club of St. Louis, Professor J. B. Johnson laid before the members the results of a recent investigation of the relative strength of wooden beams and columns in large and small sizes. It was conducted at the testing laboratory of the Washington University for the Government Forestry Division. The large beams were of selected lumber, and were tested green. They were from 18 to 24 feet in length, and were 8 in. by 12 in. in section. Eight small beams, 5 feet long and 4 inches square in cross section, were made out of each large beam after it was broken. The beams were of oak, white pine, and short and long leaf pine. Tests were also made on large pine beams, which had been taken out of the Exhibition building after thirteen years of service. The average of these tests showed that the large beams had 92 per cent. of the strength of the small ones, and that the apparent elastic limit in the large beams was 97½ per cent. of the small ones. Large columns showed a strength of 75 per cent. of small ones.

English and American Water Filtration Systems.

Mr. E. B. Weston, M.Am.Soc.C.E., has been comparing the American system of treating unfiltered water by means of sulphate of alumina with the sand method now largely adopted in England and elsewhere. He finds that the cost of constructing plant on the former system works out to $13,500 per million gallons capacity per 24 hours, and that the expense of filtering this quantity of water is $6·41; the figures for the latter system being $19,415 and $6·48 respectively. With regard to the effect of the two systems, Mr. Weston claims for the American one superiority in the clarification of, and the removal of albuminoid ammonia from, water; but he says the two systems are about equal in their capability for dealing with bacilli. Assuming, however, that a sand filter is 1½ per cent. more efficient than a sulphate of alumina one in the removal of water bacteria—and he acknowledges that the best European experience tends to show that it is—he asks whether the extra cost of the sand filtration plant will compensate for this increased efficiency. He thinks that in some cases it may, but that in many it will not.

Dock Lighting by Acetylene.

In the "JOURNAL" for Aug. 31 (p. 484), we gave an illustrated description of Kay's acetylene gas generator. The appliance is being introduced by the Manchester Acetylene Gas and Carbide Company, who have put down special plant for the manufacture of gas-producers and various fittings. The generators above referred to are made in a convenient portable form for outside lighting; and a considerable number of them have been supplied to the Manchester Ship Canal Company, for use in connection with the discharge of cargoes. They are furnished with windproof gas-lamps and special flexible pipes, enabling the lamps to be fixed up where required in ships' holds, while the generator can be placed upon the deck or the quay, and the gas conveyed by piping. Each lamp, we are informed, gives a light of 150 candles, consuming only 3 cubic feet of gas per hour, and replaces 24 ordinary oil cargo-lamps. The generator is equal to supplying the lamps for a whole night without attention. There is also complete immunity from risk of fire in discharging the cargoes, as the effect of overturning the generator would simply be to extinguish the lights.

Fletton Bricks.

A descriptive article on the compressed brick industry of the Fletton district, in the neighbourhood of Peterborough, recently appeared in the "Builder." It appears from this account that the Fletton bricks are all made from a bed of shale, or "knots," as it is locally termed, which underlies the top bed of plastic clay formerly used in the manufacture of bricks by hand. This shale is ready to be made into bricks as soon as it is got out and ground into powder, which is just sticky enough to adhere together when tightly squeezed between the fingers. The stuff passes through the moulding-presses and reaches the kilns within ten minutes after it is taken out of the ground. Hence the cheapness of the article. Moreover, the shale possesses some natural oil which assists the burning process; a very small quantity of coal being required for working the kilns. The bricks, when well made, are good; being particularly well formed and hard. They have a clear ring when struck together, and are dense and compact when broken across. At the same time, our contemporary remarks that great care in manufacture is necessary to ensure these qualities.

A New Coal Calorimeter.

Mr. C. H. Norton has described to the American Association for the Advancement of Science a new pattern of coal calorimeter which has been perfected at the Rogers Laboratory of Physics. It appears to be an improvement on the Berthelot bomb. The apparatus consists essentially of three concentric vessels, the space between the two outer ones constituting a water-jacket for the prevention of irregular radiation losses. The inside combustion chamber is completely immersed in water. It is 2 inches in diameter and 2¾ inches high, with a screw-top cover. The fuel holder is a platinum crucible, with a hole in the bottom through which passes the oxygen needed for combustion. Over this hole is a perforated tray on which the sample of coal rests. The fuel is ignited by means of a fine platinum wire placed in contact with it, and capable of being electrically heated. The products of combustion escape from the bottom of the combustion chamber, and pass up through the water in a worm pipe. With this instrument a grain of coal can be completely burnt to carbonic acid in two or three minutes, with a consumption of not more than one-half of a cubic foot of oxygen. The maximum error due to use or a fall of temperature of the gas, evaporation, or condensation of moisture, does not exceed one-th ird of 1 per cent.

The Detection of Impurities in Air by Liquefaction.

At a recent meeting of the Chemical Society, Professor Dewar read a paper on the detection of impurities in air by the process of liquefaction. In a previous paper, published in 1894, it was stated that all samples of nitrogen and oxygen properly purified are, when liquefied, clear transparent liquids, so that the solid matter which always separates when air or nitrogen or oxygen is liquefied on the large scale consists of impurities. Ordinary air, containing 4 parts of carbonic acid in 10,000 parts gives a turbid liquid from the solidification of the carbonic acid Professor Dewar has devised an apparatus for ascertaining the proportion of any gas in air that is not condensable at about −210° C. under atmos pheric pressure, or is not soluble in liquid air under the same conditions. The apparatus will show 1 part of hydrogen in 1000 parts of air. Knowing that the gas from the King's Well at Bath contains a proportion of an uncondensable gas—helium—Professor Dewar obtained a sample of it. During the process of liquefaction of this Bath gas, a solid residue was obtained, which turned out to be of organic origin—probably of the petroleum order of compounds. A quantity of helium was obtained from this sample; and the author stated that if helium were wanted on a large scale, liquid air apparatus similar to that in use at the Royal Institution, transported to Bath and worked with the gas from the King's Well, could be made to yield a good supply.

The Ventilation of the Senate Chamber, Washington.

An exhaustive report on the arrangements for the ventilation of the United States Senate Chamber recently appeared in the "Engineering Record." It is stated that in the spring of 1895, Professor S. H. Woodbridge, of Boston, was employed to examine and report upon the ventilating plant then in use, and to suggest means of improvement. The fresh air was driven into the chamber by fans discharging into a space contrived underneath the floor, whence it escaped chiefly round the perimeter, and went straight up to an outlet in the middle of the ceiling. This chamber was supposed to be a plenum; but it had so many outlets that it was impossible to keep up any pressure in the chamber. Professor Woodbridge's first care, therefore, was to reconstruct the air chamber under the floor, and rearrange the outlet so that an air pressure could be maintained in it. This condition enabled the discharge to be controlled. The air enters the chamber through perforations in the legs of the fixed desks and chairs, which are hollow, and in communication with the plenum. In addition, air is supplied round the perimeter. The foul air is exhausted from the ceiling level by means of a fan discharging into a specially designed cupola arranged with the view to taking advantage of wind action when available. The inflowing air passes over pipes which are warmed in winter and chilled in summer; the arrangement being controllable from the engineer's room by pneumatic switches which open and shut any valves desired.

TECHNICAL RECORD.

THE DETERMINATION OF THE EFFICIENCY AND LOSS OF HEAT IN GAS-STOVES.

The following is an abstract translation of an article on this subject contributed by Dr. F. Haber, of Carlsruhe, to the "Journal für Gasbeleuchtung."

Notwithstanding the fact that from 1878 onwards Dr. Bunte has demonstrated that the efficiency of combustion can be ascertained very clearly and simply by calculation from the volumes, instead of the weights, of the products of combustion, few have learnt to avail themselves of the advantages of the method. The following example of the estimation of the duty of a gas-stove, will serve to show how much less cumbersome it is than the methods commonly employed.

For determining the duty of a stove, the necessary data are: (1) The calorific value of the gas used; (2) the volume of carbonic acid and aqueous vapour produced by the combustion of 1 cubic foot of gas; (3) the percentage by volume of carbonic acid in the flue gases; and (4) the difference between the temperature of the ingoing air and the outgoing flue gases.

The determination of the calorific value of the gas is best made by means of Junkers' calorimeter, of the manipulation of which Dr. Bueb has given a good description.* The calorific value, however, is found on the basis of the water produced by the combustion being in the liquid state. The flue gases are at the temperature of the room, and cannot carry away the whole of this water in a state of vapour; and therefore the latent heat of the condensed water is included in the value found by the calorimeter. An element of uncertainty is thus introduced into the estimation, as the amount of the water produced by the combustion passing away as vapour, and the amount condensed as liquid, are unknown. The flue gases are saturated with aqueous vapour at the temperature of the room. But the gas and air supplied to the apparatus are not necessarily so saturated; and hence water produced by the combustion may partially go to saturate the flue gases, and escape condensation. Taking the extreme case of 1 cubic foot of dry gas mixed for consumption with 10 cubic feet of dry air, and yielding 25½ grammes of water among the products, if the volume of the flue gas be reckoned as 11 cubic feet 6·35 grammes of water will be necessary to saturate it at a room temperature of 73·2° Fahr. (1 cubic foot is saturated by 0·577 gramme of aqueous vapour at that temperature). Therefore the water condensed will be only 25·5 − 6·35 = 19·15 grammes, instead of the 25·5 grammes derived from the combustion; and the latent heat liberated in the calorimeter will be only about 11·5, instead of 15·3 calories. Thus the calorific value found will be 3·8 calories too low. The conditions here set forth are exceptionally unfavourable, and would never be found in actual practice. For instance, gas is often supplied through wet meters, and is then saturated with moisture. Moreover, the air of the room is seldom free from moisture; and, further, the volume of permanent gases will have undergone diminution by the combustion, and therefore there will be a smaller volume of flue gas to be saturated. In practice, therefore, the error is less than that shown above; but nevertheless it is an uncertain quantity. In the case considered, if allowance is made for the contraction on combustion, and if the gas is taken as saturated, 20·5 grammes of water will be condensed; but if the air supplied is also saturated, then 26·3 grammes of water will be condensed. The calorific value found will be about 2·9 calories too low in the one, and about 0·5 calorie too high in the other case. Though the error be not large, its amount is unknown; and since it can be avoided, it is better to give up this method of calculating the calorific value from the data afforded by Junkers' calorimeter, in all cases where precision is desired.

The better method of making the calculation is to deduct from the observed calorific value the heat of vaporization of all the water condensed in the calorimeter, which may be found by Clausius' formula $r = 607 - 0{\cdot}708t$, in which t = the temperature of the water expressed in degrees Centigrade. The calorific value of the gas, when the water produced on combustion remains in a state of vapour, is thus found. This value is free from all uncertainties except those attributable to the calorimeter itself, and represents the ideal duty to be achieved in gas-stoves; for in almost all the latter, it is considered desirable to allow the moisture in the flue gases to pass away uncondensed. If the calorific value when the moisture produced is condensed is, however, desired for any purpose, the heat of vaporization of the water produced by the combustion of a cubic foot of the gas—the amount is ascertainable in other ways—is added to the calorific value for the gas when the moisture produced remains as vapour. Or the moisture in the air entering the calorimeter can be determined.

Two very simple operations in gas analysis are required to determine the volumes of carbonic acid and aqueous vapour produced by the combustion of 1 cubic foot of gas. The first is an explosion in a suitable apparatus of a few cubic centimetres of the gas, carefully measured, with a sufficient volume of air, and the measurement of the carbonic acid produced. The operation should be performed over mercury. It gives directly the amount of carbonic acid produced by the combustion of a cubic foot of the gas. The second operation is the analysis of the spent gas from a gas-flame collected by means of the funnel devised for the purpose by Dr. Bunte. Three figures are obtained in this analysis—viz., x = percentage of carbonic acid (by absorption with solution of potash); y = percentage of oxygen (by absorption with phosphorus); and z = percentage of nitrogen (by difference). Therefrom it follows that $\frac{100\,y}{20{\cdot}9} = 4{\cdot}785\,y$ = the surplus air, and $(100 - 4{\cdot}785\,y)$ = the mixture of carbonic acid and nitrogen produced by the combustion of the gas with the amount of air demanded by theory. The following example explains the procedure.

Percentages found: Carbonic acid, 7·60; oxygen, 6·34; and nitrogen, 86·06. Then the surplus air amounts to 4·785 × 6·34 = 30·34; and therefore the carbonic acid-nitrogen mixture from the actual combustion = 100 − 30·34 = 69·66, of which 7·60 has already been found to be carbonic acid—leaving a residue of nitrogen = 62·06. This volume of nitrogen is clearly the residue of the air of which the oxygen was consumed in the combustion of the gas, and yielded 7·60 of carbonic acid. But 79·1 volumes of nitrogen are associated with 20·9 volumes of oxygen in air. Therefore the oxygen used in the combustion amounts to $\frac{20{\cdot}9 \times 62{\cdot}06}{79{\cdot}1} = 16{\cdot}40$. But when carbon is burnt to carbonic acid, the oxygen used is equal in volume to the carbonic acid formed. Therefore 7·6 of this 16·4 volumes of oxygen are consumed in producing the carbonic acid—leaving 16·4 − 7·6 = 8·8 volumes of oxygen available for the formation of water. Then 8·8 volumes of oxygen form 17·6 volumes of water vapour. The ratio of carbonic acid to water vapour produced is thus found—*i.e.*, 7·6 volumes to 17·6 volumes—and from the explosion, the actual volume of carbonic acid produced from a cubic foot of gas has been ascertained. The actual volume of water vapour produced in the combustion of a cubic foot of gas is then arrived at by simple proportion.

The same result may be found graphically. On both axes of a system of co-ordinates, the figures 0 to 20·9 are set out at equal distances; and a line is drawn from the origin to the point of intersection of the ordinate and abscissa at 20·9. Then, with the percentage of carbonic acid in the spent gas as ordinate, and the sum of the percentages of carbonic acid and oxygen as abscissa, an intersecting point is found, through which and the point 20·9 on the abscissæ axis a line is drawn, and prolonged until it cuts the line passing through the origin and the point of intersection of the abscissa and ordinate at 20·9. The point where these lines cut has ordinate and abscissa of equal length; and the figure representing that length is the percentage of carbonic acid in the gas theoretically formed by the combustion. The percentage of nitrogen in the same gas is given by subtracting this figure from 100; and on multiplying the remainder—*i.e.*, the percentage of nitrogen—by 0·26423, the volume of oxygen consumed is found. Then, as before, the volume of water vapour formed is double the difference between the volume of oxygen and the volume of carbonic acid formed by the combustion. In practice, this graphic method is very rapidly executed.

An exact result must be ensured by making several analyses of the spent gases from the flame. Three or four should suffice if the analyst is a competent man; and these can be made in about twenty minutes, if several burettes (Hempel's or Bunte's) are used side by side. The method is not only incomparably easier and quicker, but also more reliable than the deduction of the amount of hydrogen from a complete analysis of the coal gas. It, however, introduces one error; but it is a small one, and therefore negligible. Coal gas contains oxygen and nitrogen; and the ratio of the latter to the former is greater in it than in air. For instance, Carlsruhe gas contains 1·5 per cent. of nitrogen, in addition to 1·5 per cent. of air. The air introduces no error; but the 1·5 per cent. of nitrogen causes one of small but determinable magnitude. When Carlsruhe gas is burnt without a surplus of air, a mixture consisting of 11·6 per cent. of carbonic acid and 88·4 per cent. of nitrogen, is obtained. A cubic foot of the gas yields about 0·570 cubic foot of carbonic acid. Therefore 11·6 volumes of carbonic acid arise from 20·35 volumes of coal gas, of which 0·3 volume will be nitrogen. Thus only (88·4 − 0·3 =) 88·1 volumes of nitrogen are derived from air; and the oxygen consumed is not 0·26423 × 88·4, but 0·26423 × 88·1—that is, not 23·37 volumes, but 23·29 volumes. The water vapour formed at the same time as the 11·6 volumes of carbonic acid becomes 23·38 volumes, instead of 23·54 volumes. The volume, in other words, is smaller by about 0·68 per cent. than it would be if the correction were not made; and so small a deviation is of no moment in the estimation of efficiency, as will be evident later.

There is no special risk of error in ascertaining the data referred to under heads (3) and (4); and therefore we may pass at once to an example of the determination of efficiency from the following data: (1) The calorific value of the gas, supposing the water produced by combustion remains in a state of vapour, is 138¾ calories per cubic foot. (2) One cubic foot of the gas produces 0·570 cubic foot of carbonic acid and 1·157 cubic feet of water vapour. (3) The flue gases contain 2·9 volumes per cent. of carbonic acid. (4) The difference between the temperatures of the ingoing air and the outgoing flue gases is 110° C. (230° Fahr.).

* See "JOURNAL," Vol. LXV., p. 644.

A cubic foot of flue gases contains 0·029 cubic foot of carbonic acid; and since 0·570 cubic foot of carbonic acid is produced with the liberation of 138¾ calories, the production of 0·029 cubic foot is accompanied by the liberation of 7·06 calories. These 7·06 calories heat 1 cubic foot of dry flue gases, *plus* the water vapour accompanying 0·029 cubic foot of carbonic acid—which will, according to (2), amount to 0·05887 cubic foot—to an initial temperature of 747·9° C., as is evident from the calculation—

	Specific Heat Calories per Cubic Foot.		Calories.
0·029 cubic foot of carbonic acid	0·01209	=	0·00035
0·971 „ „ nitrogen +'air	0·00869	=	0·00844
0·05887 „ „ water vapour	0·01095	=	0·00064
Total heat necessary to raise one cubic foot of flue gases 1° C.		=	0·00943

Therefore 7·06 calories will raise 1 cubic foot of flue gases by $\frac{7·06}{0·00943}$ = 747·9° C. But the flue gases actually leave the stove at a temperature 110° C. above that of the air entering it. Therefore the heat carried away by them is $\frac{110 \times 100}{747·9}$ = 14·7 per cent. of the total heat. Hence the available heat amounts to 85·3 per cent. of the calorific value of the gas.

It is evident that the error of 0·68 per cent. in the determination of the water vapour referred to above is insignificant, as the correction would only affect the sixth decimal place in the value 0·00943. It might also appear desirable to split up the 0·971 cubic foot of air and nitrogen into nitrogen and oxygen, and make a separate calculation for each of these gases, as their specific heats are not exactly the same. A closer inspection will show, however, that this extra labour is superfluous. The specific heats under constant pressure per cubic foot are: Nitrogen, 0·00868; oxygen, 0·00880; and air (by calculation), 0·00870. The specific heat of the mixture of nitrogen and air occurring in the flue gases will approximate to that of air the greater the excess of air, and to that of nitrogen the smaller the excess of air. The greatest error in the total value that can arise from this source amounts to only 0·15 per cent.; and it is therefore quite permissible to adopt 0·00869 for the specific heat of the mixture of nitrogen and air in the flue gases.

On surveying this method of calculating the efficiency of gas-stoves, it will be seen that neither an analysis of the gas, a specific gravity determination, nor a knowledge of the consumption of gas per hour is required. The last item is, however, a useful accessory to the efficiency estimation, as it indicates the conditions under which the determination is made—*i.e.*, whether or not the stove is burning at its full consumption.

THE DISTILLATION OF SHALE.

At the November Meeting of the Scottish Section of the Society of Chemical Industry, held at Broxburn, Linlithgowshire—Mr. GEORGE T. BEILBY, the President of the Section, in the chair—several interesting matters connected with the distillation of shale were discussed. Special arrangements were made for the conveyance of members coming from Edinburgh and Glasgow to and from the railway stations; Broxburn being some distance therefrom. On account of these facilities, there was a large attendance of gentlemen from both cities, and these, with a considerable local contingent, made it one of the best-attended meetings the Society ever held in Scotland.

The first part of the proceedings consisted of the showing on the screen of a series of views of retorts for distilling shale, which were explained by the Chairman.

Mr. NORMAN M. HENDERSON, Manager of the Broxburn Oil Company, had prepared a paper giving a history of the development of the shale-retort; and on account of the condition of his eyesight, it was read by Mr. Hunter. In it, he said it was quite appropriate that the Scottish Section should meet at Broxburn to discuss the retorting of shale; for the Broxburn district had been associated with the manufacture of oil from shale for 36 years. It was in 1859 that Mr. Robert Bell leased the minerals in the district, for the purpose of working coal and ironstone. He shortly afterwards found large supplies of rich shale in the ground, capable of yielding over 30 gallons of crude oil per ton. Several oil-works were started; but as they could not get more than 1s. per gallon for their oil, they were unprofitable. The Broxburn Oil Company was formed in 1869. In 1872 he introduced the retort known as the "gas-loop" retort, in which the spent heat was first employed to heat the retort. In the same year, the cost of production at Broxburn was lowered by about 50 per cent.; and the cost of crude oil was reduced from 4·28d. to 2·49d. per gallon. Besides this, the yield of sulphate of ammonia was some 16 or 17 lbs. per ton of shale, as compared with only 5 or 6 lbs. under the old system. The new retort gave a yield of 33 gallons of crude oil per ton; and as it was worked at a low temperature, the crude oil was of excellent quality and easily refined, and moreover it contained a large quantity of paraffin scale. It was heated from without by its own permanent gases and spent shale, with about 1 cwt. of coal per ton of shale. The charge remained in the retort for 16 hours at least. The longer it was left there, the greater was the yield of ammonia; but at that period it was not considered profitable to leave it in beyond a certain time. The Young and Beilby retort came out next; giving a large increase of ammonia, associated with a great rise of temperature inside the retort during the second or ammonia part of the distillation. He considered that the Young and Beilby arrangement could be improved upon; and in 1889, he took out a patent for a retort, the upper portion of which was kept at a temperature of about 900° Fahr., and the lower portion at about 1300° Fahr. In the bottom of the retort there was a toothed roller, which delivered the spent shale into the hopper below, and which also kept the shale in motion during the process of distillation. A feature of this retort was that it was heated by gas from dross coal, made in ordinary producers apart from the retorts. It was found to be very advantageous in maintaining and regulating the heats; while the flues were kept clean and free from dust, and a saving of fuel was effected. A further feature was the large hopper at the top, which contained sufficient shale for 18 hours; thereby allowing charging to be entirely stopped at night and on Sundays. It was also very much easier to work; a bench capable of putting through 160 tons of shale per 24 hours being charged by two men. The retort was 28 feet high; and this increased height, with the moderate heat, gave a greater yield of crude oil of about 3 gallons per ton of shale, and an increase of sulphate of ammonia from 16 or 17 lbs. to 43 lbs. per ton. One of the retorts, which had been going for 6½ years was examined recently; and it was found that both brick and iron work were as good as when first started. He had prepared the following table of costs:—

	Total Cost of Retorting Shale, Coal, Labour, Stores, Maintenance, &c.		Net Cost of Retorting, after crediting Sulphate of Ammonia at £14 per ton.
I. Old horizontal retorts, in use at Broxburn in 1877. . .	4·28d.	..	3·91d.
II. Old vertical retort, the best constructed type of vertical retort in use in 1877. . .	3·27d.	..	2·89d.
III. The Henderson retort, the first year's working in 1879	2·31d.	..	1·62d.
IV. The Henderson new improved retort (1889), present year's working	1·89d.	..	0·16d.

The CHAIRMAN asked: (1) How long is the shale in the Henderson retort, as compared with others; and (2) how much permanent gas does the retort give off per ton of shale, as compared with others?

Mr. HENDERSON replied that the shale was 42½ hours in the retort; and if he remembered aright, it used to be 21½ hours in the old vertical retort. It was difficult to determine the exact quantity of gas given off. The only way he had measured it was by the exhauster; and the measurements they took from one bench, with a new exhauster going at 42 revolutions per minute, having a ½-inch water vacuum on the one side and a 4 to 5 inch water pressure on the other, gave practically 10,000 cubic feet of gas per ton of shale. This gas yielded about 41 per cent. of combustible matter.

Mr. A. H. CRICHTON (Philpstoun), described a retort which he uses, in which there is a mechanical drawing apparatus. This consists of a series of fingers fixed rigidly on a hinged rod at the bottom of the retort. There are two sets; and when the fingers are in a horizontal position, their points meet. When they are allowed to drop into a vertical position, the spent shale falls into the hopper. Mr. Crichton said they had the most perfect control over the shale in the retort—they could take out a bonnetful or a hutchful as they liked. In building this bench, they had erected the gas-producers apart from the retorts, as they required to be reconstructed much more frequently than the retorts.

Mr. JAMES BRYSON (Pumpherston) then described a retort which he employs, the feature of which is also an automatic drawing apparatus. The retort is circular; and at the bottom, where the spent shale rests, there is a horizontal iron table, which scarcely fills the whole diameter of the retort. A curved arm on the upper surface of the table is made to rotate. Its effect is to drive the spent shale over the edge of the table; and it then falls into the hopper. The hopper is closed at the bottom by a conical stopper, which can be withdrawn in a moment, and the shale falls out. The stopper is then instantly replaced; and thus the drawing only occupies a few seconds. In this retort, about 4 tons of shale can be put through in a day. Every individual retort is supplied with its own fuel gas, and is isolated from its neighbours; and thus the supply of gas can be regulated according to the conditions of each retort. No fuel was required, except the gases produced in the retort. The average cost of retorting was reduced from 22d. (Young and Beilby's figure) to 12d. per ton. As the value of the products was about 1s. per ton higher, they had altogether a difference of 22d. per ton in favour of the new retort. The experimental retort which they erected had retorted 4312 tons of shale without requiring repair in any way—an experience which, so far as he knew, was unique in the history of the oil industry.

Mr. CRICHTON said it had always seemed to him that the great incubus on the oil industry was the fuel. He supposed that Mr. Bryson's retort effected a saving of 5d. or 6d. per ton. He would like to know what the value of the heating agent was, when compared with that employed for the Young and Beilby retort.

Mr. BRYSON replied that they obtained about 13,000 cubic feet of gas. An analysis of gas from the Hermand retorts, made by Mr. Rowan, was as follows: Carbonic acid, 23 per cent.; carbonic oxide, 4·6; hydrogen, 13·4; olefines, 1·6; marsh gas, 19·7; oxygen, 1·3; and nitrogen, 37. An analysis of their gas gave: Carbonic acid, 22·08 per cent.; carbonic oxide, 9·37; hydrogen, 55·56; olefines, 1·38; marsh gas, 3·07; oxygen, 1·18; nitrogen, 6·33. There was 70·46 per cent. of combustible matter.

Mr. HENDERSON thought the increased duty was probably due to the great quantity of hydrogen which was obtained by Mr. Bryson's retort. It would be a very good thing if oil-works' managers were to take samples of gas regularly, and have them analyzed, and then compare notes.

The CHAIRMAN suggested that, as the subject was so interesting, and there was so much to be said upon it, they should adjourn it to a future meeting. This was agreed to.

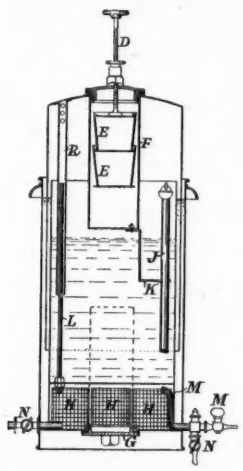
Mr. MOFFAT JOHNSTON (Uphall) then introduced a discussion on the methods in use for determining in the laboratory the amount of sulphate of ammonia obtainable in the works from a given sample of shale, with a view to the adoption of a standard in the trade. Several gentlemen took part in it.

On the motion of Mr. JOHN FYFE, Manager of Young's Paraffin Light and Mineral Oil Company, the Chairman was thanked for presiding.

REGISTER OF PATENTS.

Acetylene Gas Generator, Purifier, and Container.—Fowler, T. R., of Liverpool. No. 28,206; Dec. 10, 1896.

This apparatus consists of an upright vessel arranged with inner walls; the annular space between being filled to near its top with water, in which floats an inverted cylinder or bell. A screwed rod D passes through a stuffing-box in the top of the bell, and at its lower end carries one or more cages E, in which the carbide is placed. Each cage is made conical, and carries at top a pair of inwardly projecting pins or lugs,



which pass upwards through recesses in the bottom of the cage above—a slight turn serving to retain their relative positions. One or more of such cages are inserted into the generator at a time, according to the quantity of gas likely to be required. There is an outer cage F, inside the bell, which is intended as a safeguard in case by chance the cages should become detached. The various parts of the apparatus are so proportioned that in such an event, when the bell rises owing to the generation of gas, the bottom of the outer cage F will be well above the surface of the water in the inner cylinder.

Beneath the bottom of the inner cylinder is the purifying chamber, which may be filled and emptied through a man-hole provided with a lid G. The purifying material (such as a mixture of lime and charcoal) is contained in baskets H. In the smaller sizes of the machines, a single cage is attached direct to the lid G; and in that case it is higher than those shown, and projects up farther into the body of the apparatus, as indicated by dotted lines.

The safety-valve I has an exit-tube J, which passes through the bottom of the apparatus—shown broken off short. When the apparatus is used in an enclosed room, the tube J would be connected with the outside air by a length of flexible pipe. The valve is lifted from its seat by a yoke K, attached to the bottom of the cage F; rising and falling with it. A pipe L leads from near the top of the inner cylinder to the purifying chamber; while the exit of the gas is provided for by the pipe M. Drip or drain cocks N are used for getting rid of condensed water. When the apparatus is used without a safety-valve, a depending pipe R, perforated at top, is provided; and this acts as a guide to prevent the turning of the bell.

The mode of action is as follows: Water is passed in the inner cylinder and in the annular space around it; and the bell is then placed in position. One or more cages E charged with carbide are then inserted; and the lid of the bell is screwed down. When it is desired to commence the generation of gas, the rod D is screwed down a little; and the lower layer of the carbide is thus brought into contact with the water. The first gas is allowed to escape, being mixed with air; but as the generation continues, the bell rises, and thus lifts the carbide clear of the water. As the gas is withdrawn for storage or use, however, it again falls; and so on.

Acetylene Gas Burners.—Wise, W. L.; a communication from J. S. Billwiller, of Untereggen, Switzerland. No. 29,980; Dec. 29, 1896.

In the course of his specification, the patentee remarks: It is well known that in burning acetylene gas, certain impurities in the gas, produced during its generation—and resulting from, *inter alia*, the impurity of the materials, acid vapours, and especially gaseous phosphoric acid which is usually deposited at the orifices of the burners—act injuriously upon the material surrounding the burner-orifices, and directly or indirectly cause their gradual choking. In order to obviate this drawback, a burner constructed in accordance with the present invention is provided over the nozzle with a cap formed with one or more holes corresponding to the apertures in the nozzle; the first-mentioned holes being directed similarly to the last-mentioned ones, but larger. The gas issuing from the holes in the nozzle passes through the corresponding holes in the cap, drawing air along with it. It then burns only above the outer surface of the cap; so that the choking of the holes in the nozzle is obviated.

The drawings accompanying the specification represent various burners, in each of which there are two arms or nozzles, so arranged that the gas issuing from the two forms a single flame. The invention "embraces all conceivable constructions without exception; for it is immaterial to the invention or its applicability whether a burner has one or more nozzles, whether these nozzles have each one or more orifices or holes, in what way the arms or nozzles and their orifices or holes are mutually arranged, how the arms or nozzles are constructed, and what form their orifices or holes have."

In the type of burner selected for illustration, there are two arms, which branch off laterally from a support or angle-piece, and whose upwardly converging ends are formed as nozzles. Each of these nozzles has an orifice or hole; and at a certain distance from and over each of the nozzles, there is a conical or other shaped cap, with an opening or hole which corresponds with the opening or hole in the corresponding nozzle, but has a larger diameter—three times larger—than it. Fig. 2 shows one of these caps in plan. In order to fasten the caps over the nozzles of the burner, each cap has two diametrically arranged lateral lugs or arms, which have, on their under side, eyes in which engage two bent supporting hooks fastened to a ring placed on the nozzle and lying on a band or projections on it.

The burner-nozzles advantageously consist of material that is a bad conductor of heat—German silver, platinum, steatite, or soapstone. The cap, on the contrary, consists of a material that is a good conductor of heat—as silver or copper. "Hereby the condensation of the acid vapours that are formed during the combustion is limited to the cap; so that also hereby the stopping up of the fine nozzle-orifices is prevented as far as possible."

Incandescence Bodies.—Langhans, R., of Berlin. No. 501; Jan. 7, 1897.

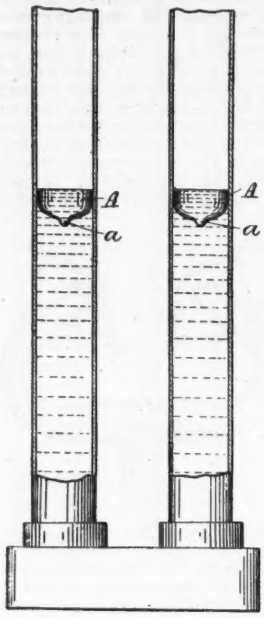
The proposal in this patent is to make use of vanadiniferous thoria as an illuminant. In patent No. 22,396 of 1893, the patentee showed that the light-emitting capacity of zirconia is capable of being increased, and the character of the light improved, by the agency of a very small admixture of vanadiniferous pentoxide (V_2O_5); "the presence of this agent having also the effect of increasing the strength of the incandescing body." Further experiments, he claims, have proved that the vanadiniferous pentoxide behaves in a similar manner when combined with thoria; so that the former can likewise be made use of for improving thoria-incandescing bodies as regards both their light-emitting power and their strength. The proportion of vanadiniferous pentoxide required for obtaining the best effects is from ½ to 2 per cent.; and it should be mixed as intimately as possible with the thoria. When exposed to the Bunsen flame, a freshly prepared mixture of thoria with a small proportion of vanadiniferous pentoxide "glows at first with a disagreeably yellowish tint, which subsequently changes to a greyish tinted light, and then into a brilliant white light of great power."

Describing his procedure, the patentee says: "In the manufacture of the improved thoria-incandescing media, I proceed in any of the known ways. For instance, I may impregnate thoria with an aqueous solution of pentoxide of vanadine or of a vanadyle salt. As is known, vanadyle salts are obtained by dissolving vanadine pentoxide in an acid, and properly heating; vanadine pentoxide being left behind. The bodies to be used for incandescent lighting are formed from the paste or mass thus produced, and are calcined until they radiate light. Or I may first form the body from thoria, and then impregnate with the watery vanadiniferous solution. Or I may dissolve a thorium salt—for instance, thorium nitrate—in an aqueous solution of pentoxide of vanadine or of a vanadyle salt, and impregnate a fabric or other fibrous foundation with the liquor; the impregnated fabric or body being then dried and finally calcined. Or I may evaporate the vanadiniferous thoria solution to dryness, form the residue into the shape desired, and calcine the body thus obtained. Or I may produce a thoria body by means of electrolysis, as described in patent No. 22,396 of 1893; impregnate with an aqueous solution of pentoxide of vanadine or of a vanadyle salt; and, after drying the impregnated body, calcine it."

Gauges.—Helps, J. W., of Croydon. No. 879; Jan. 12, 1897.

As illustrated, this device consists of a body A, so weighted that its upper part will be level with, or only very slightly above, the level of the liquid

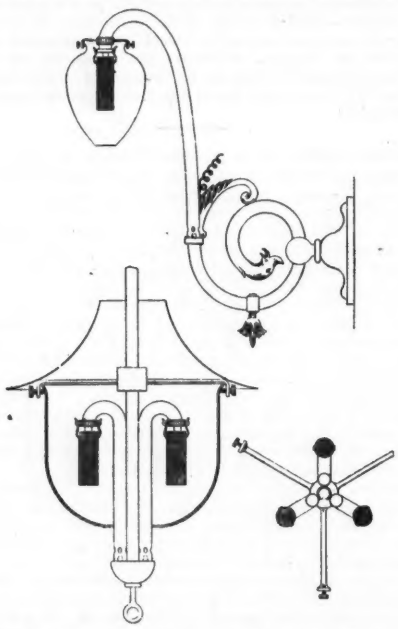
in the indicator or gauge; its whole body, or the main portion of it, being submerged. If the device be made of a diameter but slightly less than that of the gauge-tube, and it be so weighted that its upper surface is level with the surface of the liquid therein, the device does not adhere



to the sides of the tube, as it would otherwise be liable to, especially in cases where the contents of the tube cause a sticky deposit. The patentee prefers to make the device of hollow glassware, coloured so as to be very distinctive, and to make its lower part with a small well, or depressed portion, at its centre, as shown at *a*, in which the weight—say, a globule of mercury—which maintains the device in proper position in the liquid is placed.

Inverted Regenerative Incandescent Burners.—Kent, H. A., of Bounds Green, N. No. 3667; Feb. 11, 1897.

The patentee proposes to employ incandescent mantles larger in diameter and shorter in length than usual, and attached to the burner as shown in the engraving—the upper figure representing a lamp with a single burner; and the lower one, a vertical section and sectional plan of the underside of a lamp in which three burners are contained.



Referring to the former, it will be seen that the bracket has rising from it a pipe, the upper end of which is turned down, and carries at its lower end a burner; the gas issuing by a nozzle and drawing in air by the perforations shown. When the tap is turned on, gas passes into the bent tube and draws in air; but as the upwardly projecting part of the tube is longer than the turned down portion carrying the burner, firing-back is prevented. The incoming gas and air are heated by the ascending heat from the burner, before they issue from it; and in this way "a regenerative effect and proper consumption of the gas are insured."

Incandescent Mantles.—Foster, F. R., of Milwaukee, Wis., U.S.A. No. 11,739; May 11, 1897.

This invention relates to the construction of incandescent mantles consisting of layers of copper, platinum, and ruthenium, electrically deposited upon a suitable base or hood, which is subsequently destroyed by heat.

The patentee claims to have found out that, by treating a combustible base with graphite or other suitable medium, and the oxide of chemically pure platinum, and the oxide of ruthenium, he is enabled "to produce a much more durable and substantial form of mantle than has been heretofore possible, and one which, when in use, may be subjected to severe vibration or jar without harm, or may be freely handled at will without liability of fracture."

To this end, he prepares a suitable combustible base, which may be of any desired form or structure—preferably a skeleton or network hood—by applying to the outside of the base a thin layer of graphite. He then deposits upon the graphite coating, a light layer of copper; this deposit being made by the ordinary electro-plating process. He then similarly applies a coating of platinum, and finally a somewhat heavier coating or layer of ruthenium upon the outside of the platinum coating. After the several coatings or layers have been applied to the combustible base, the mantle is heated to such a temperature as to consume the combustible material which forms the base, and leave only the exterior composite covering, consisting of the metals already named.

Gas-Stoves.—Johnson, J., of Lowell, Mass., U.S.A. No. 18,106; Aug. 3, 1897.

In this gas-stove, there is a series of burners having converging orifices, adapted to produce flames that are horizontal and spread laterally without lengthening in the same proportion. The burners are disposed opposite each other; so that the issuing flames project towards each other. A shield or air-shaft surrounds the burners, and allows a current of air to pass transversely through the sheet of flame formed by them. While the flames spread laterally, in proportion to the increase of the pressure of the gas, they do not extend outwardly in a direct line from the burners—in other words, they will not be lengthened in the same proportion. Therefore, as the burners are arranged opposite to each other, the tips of the flames project towards each other and leave more or less of a space between the tips. Thus the several flames which go to make up the horizontal sheet which is traversed by the air-shaft are not to be considered as severally overlapping each other, but as occupying positions contiguous to each other.

Repairing Gas and Water Pipes and Mains.—Barnett, A. E., of Fermoy, Co. Cork. No. 21,003; Sept. 13, 1897.

The patentee claims the use, in repairing pipes and mains, of a socket or collar made in halves, with a flange at each side of each half, the flanges of one-half having projections or ridges (preferably with return ends) destined to fit into corresponding grooves provided in the opposing flanges of the other half of the socket. The dividing line between the two halves is in the plane of the axis of the pipe under repair, the halves being held together by bolts, and each end being provided with annular recesses surrounding the pipe. The upper or lower half, or both the halves, of the socket are provided with branch sockets, formed with, or separately from, the half sockets above referred to; the branch sockets having projecting ends which enter holes existing or provided for them in the pipe under repair.

Automatic Gas-Igniting Device.—Killing, C., of Dusseldorf, Germany. No. 21,935; Sept. 24, 1897.

The patentee claims as his invention: "(1) The process [described below] for the production of an igniting mass suitable for the incandescence bodies of incandescent gas-lamps, which consists in impregnating a composite fabric made from platinum wire and cotton with a solution of thoria and platinum, or a substitute, and then drying the same. (2) An incandescence mantle provided with a self-igniting top or core, and with igniting threads prepared as described, and secured to the mantle in a downward direction, for the purpose of enhancing the certainty of ignition."

He says that, to obtain the maximum effect, he has prepared a great number of mixtures of rare earths and platinum black. It is a well-known fact that thorium nitrate, when burnt to ashes, forms an oxide in the shape of a very frothy and yet fire-proof mass. Now, if thorium nitrate be mixed with platinum chloride, the mixture, on incineration, leaves a fire-proof and spongy mass, which possesses in a high degree the property of igniting combustible gas mixtures. He prefers to use a mixture of about 1 part of thorium nitrate and $2\frac{1}{2}$ parts of platinum chloride. Thorium may be partly or wholly replaced by other rare earths; and platinum by other elements of the platinum group. In order to obtain a suitable support for this mixture, without reducing its igniting capacity, a composite fabric is prepared in the following manner: Cotton yarn is spun together with a very thin platinum wire of about 0·03 mm. thickness; and the composite yarn is used for making a knitted fabric similar to the mantles for incandescent gas-lamps. The network is then impregnated with a solution of the mixture, and subsequently dried. When burnt to ashes, the fabric thus prepared leaves a kind of basket-work of exceedingly fine platinum wire, the meshes of which are filled with a spongy or frothy mass, composed of thoria and platinum black, and having a great igniting power, besides being fire-proof. If this mass is placed in the crown of an incandescence mantle, and the gas is turned on, the mass will get intensely hot and ignite the mixture of gas and air, with which it is in contact.

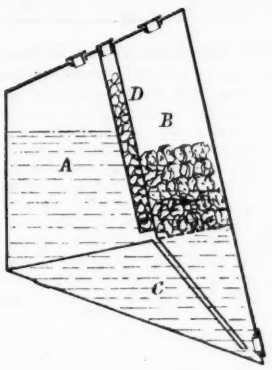
The igniting capacity of such a device is said not to be materially reduced by leaving it in the bunsen flame of the incandescent gas-lamp for several hundred hours. To increase the certainty of action, a loop of fine platinum wire may be embedded in the black igniting mass; but the patentee prefers to saturate several platinum-cotton threads with a solution of thorium and platinum or their substitutes (among which iridium may be used with advantage), and to sew the dried threads into the incandescence mantle in a downward direction, following the meshes. The ashes of these threads (thoria-platinum black) conduct the heat down to the burner.

To prepare a self-igniting incandescence mantle, it is only necessary to take an ordinary incandescence mantle, and sew into its crown a small piece of the composite platinum-wire and cotton fabric impregnated with

thorium-platinum solution, and into the mantle itself to sew several of the threads from the top downwards. When the mantle is burnt to ashes, the igniting mass and threads are also incinerated, and leave an incandescence body capable of automatically igniting the gas.

Producing Acetylene Gas.—Flock, A., and Messedat, F., of Cologne. No. 22,730; Oct. 4, 1897.

The apparatus consists essentially of four principal parts: The chamber A, forming a water reservoir. The chamber B, which contains the calcium carbide. The chamber C, which is connected by a perforated bottom with the reservoir B. The drying chamber D, which is filled



with pumice stone impregnated with sulphuric acid, with glass balls moistened with sulphuric acid, or with any other suitable material that will absorb the water or impurities carried over with the acetylene gas. The water passes from the chamber A into the chamber C, through the pipe shown, and rises in the latter through the perforated bottom into the chamber B. The gas produced by the action of the water flows into the drying apparatus D, where it is filtered, and then passes away into the service-pipe. Whenever the production of gas in the chamber B becomes too great, it drives the water out of the carbide chamber B back into the chamber C, from which it is forced back into the reservoir A, and finally escapes through the perforated filling screw at top. Immediately the water is forced away from the carbide by the gas itself, the further production of gas ceases; and consequently excessive pressure can never occur in the apparatus.

APPLICATIONS FOR LETTERS PATENT.

28,031.—Wood, E. A., "Incandescent gas-burners." Nov. 29.
28,059.—Parkinson, W. C., "Coin-freed gas-meters." Nov. 29.
28,060.—Hooker, L., "Incandescent gas-light tassel." Nov. 29.
28,094.—Tyree, W., "Acetylene gas generator." Nov. 29.
28,102.—Wagner, M., "Generating acetylene gas." Nov. 29.
28,106.—Evans, A. J., "Gas-producer." Nov. 29.
28,110.—Thompson, W. P., "Igniting gas by its own action." A communication from H. Schimmel. Nov. 29.
28,121.—Morrison, A. J., "Combined generator and lamp for acetylene gas." Nov. 29.
28,125.—Leroux, E., "Acetylene gas-lamps." Nov. 29.
28,167.—Chitty, J., "Portable acetylene gas generators." Nov. 30.
28,171.—Clark, W. G., "Acetylene gas-lamps." Nov. 30.
28,198.—Lewitzki, L. V., "Incandescent gas-burners." Nov. 30.
28,217.—Deutsch, H., "Deodorizing the exhaust gases from hydrocarbon and gas motors." Nov. 30.
28,226.—Hartenstein, H. L., "Carburetting calcium." Nov. 30.
28,247.—Imray, O., "Gas-motors." A communication from R. Diesel. Nov. 30.
28,258.—Keck, L. J., "Generating and burning acetylene." Nov. 30.
28,264.—Grubb, Sir H, "Generation of acetylene gas." Nov. 30.
28,332.—Thwaite, B. H., and Allen, H., "Leak-detector." Dec. 1.
28,367.—Humfrey, C., "Gas-producers." Dec. 1.
28,368.—Leich, J., and Delporte, S., "Compressing and mixing gas and air for lighting and other purposes." Dec. 1.
28,384.—Clark, A. M., "Atmospheric burners." A communication from The Diamond Light Company (Incorporated). Dec. 1.
28,387.—Leigh, H. H., "Burners for acetylene gas." A communication from C. de E. Llatas. Dec. 1.
28,390.—Boult, A. J., "Internal combustion engines." A communication from M. H. Rumpf. Dec. 1.
28,399.—Gearing, E. G., "Acetylene generating and storing apparatus." Dec. 1.
28,411.—Sharp, J., "Fluid meters." Dec. 2.
28,418.—Lanchester, F. W., "Blowing and exhausting apparatus." Dec. 2.
28,434.—Blakeley, J. F., "Combined automatic atmospheric and water condenser, tar extractor, and gas washer." Dec. 2.
23,439.—Sockeel, V., Lauby, A., Drisse, C., and Sneck, -, "Production of acetylene gas." Dec. 2.
28,521.—Smith, T. B., "Carrying shades or globes upon pendant fittings." Dec. 3.
28,526.—Wigham, J. R., "Increasing the illuminating power of gas made from coal or other material." Dec. 3.
28,541.—Mordaunt, F. G., "Gas-stoves." Dec. 3.
28,545.—Varty, F., "Gas and other motors." Dec. 3.
28,623.—Hunter, J. W., "Gas or oil engines." Dec. 3.
28,669.—Mackenzie, W. J., "Protecting and cleaning gas-burners." Dec. 4.
28,698.—Kirk, R., "Generating and using acetylene gas." Dec. 4.
28,706.—Moeller, J., "Incandescence mantles." Dec. 4.
28,709.—Mahnke, G., and Kraft, C., "Igniter with protecting arrangement, for incandescent gaslight mantles." Dec. 4.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

The Extinction of Gas Companies.

Sir,—The letter of "A Gas Secretary" in your last issue has a timely interest for me, as the Filey Gas Company, of which I have the management, is just now the "toad" under the Urban Council "harrow," and is threatened with the extinction which he predicts will overtake all well-to-do gas companies.

I kept a stout heart, when the subject of purchase was first mooted, as it appeared to me that a Company established by Act of Parliament, and pursuing the even tenor of its way, was in no fear of being bought up. The Filey Urban Council have, however, made a demand for the works, and lodged a Bill for the compulsory purchase thereof. I have since taken some little trouble to find if there are any precedents for the property of shareholders being wrested from them under like circumstances. All the instances of transfer I have come across, have been made under some of the following conditions:—

A.—The company and the local authority have come to terms beforehand. The company have, perhaps, been in a weak position, working only as a joint-stock concern; and may have been subject to much petty tyranny and annoyance from the authority. Or they may have received a liberal and tempting offer for their works, and accepted it.

B.—The company were applying to Parliament for statutory powers, and the local authority took advantage of the opportunity to oppose; and, by representing that such an undertaking as the supply of gas and water should be in their hands, and not in those of private individuals, induced a Parliamentary Committee to entrust them with the work.

C.—The company have been applying to Parliament for an extension of their powers. This, though not so weak a position for a company as the preceding one, still leaves them open to a similar attack.

There may have been some cases in which a company have lamentably failed to perform their duty to the public, which they took upon themselves; and Parliament may have deprived them of their powers and privileges, and handed them over to the local authority—the initial steps being taken by the authority. But I have not found any.

I have not discovered any instance in which a company possessing statutory powers, and conducting their business in accordance with them—faithfully carrying out their obligations, and treating their customers liberally—and not "being in Parliament," have, upon the application of the local authority, had their Charter cancelled and their business transferred to such authority. I am in search of such a precedent, and shall be under an obligation to "A Gas Secretary" or anyone else who can refer me to one. Had the Gas and Water Companies Association, of days gone by, been in existence, an appeal might have been made to them for a mustering of the "gas clans" to resist the raiding and destruction of gas companies by the Collectivists.

It appears to me the Filey Urban Gas Bill would have made a good test case. The Company's last Act was obtained in 1891; and the Urban Council, in their desire to upset the settlement then arrived at, make no railing accusation against the Company, but simply allege that "it is expedient" they should have the supply of gas and water. The works were offered to them some ten years ago, at a low price, when the Company were struggling in adversity. It is only since the sun of prosperity has shed its genial rays upon the concern, that the Council have had a longing desire for it. The shareholders naturally wish to warm themselves in those rays, at least until the chill penury of past days has been dissipated.

Henry Tobey.

Malton, Dec. 10, 1897.

In the letter of "A Gas Secretary" on the above subject last week, the writer, it may be remembered, referred to the gradual scattering of gas companies' shares, consequent upon the holders residing at a distance; and he expressed the opinion that, in the case of new capital, "where the money can be obtained in the district of supply, not one penny ought to be taken from outside." Citing the practice of the South Metropolitan Gas Company in offering stock to their consumers, he asked Mr. George Livesey to say how he gets over the auction clauses. We may point out to our correspondent that Mr. Livesey has on several occasions made statements on the question of selling stock to consumers, which may be put together as follows: Some seven years ago, the South Metropolitan Company offered some ordinary stock for sale by auction at the full market price, and only a small proportion was sold. The Act prescribes in such cases that it may then be offered to the shareholders at the reserve price; but it occurred to Mr. Livesey that it would be a good thing to offer it to the consumers. He saw the late Sir Henry Calcraft, then Secretary to the Board of Trade, on the subject, who told him the Board would raise no objection. The success was so complete that the next issue of stock was not by public auction but by tender; and in order not to succeed in getting tenders, the letter of the Act was complied with by advertising only the prescribed number of times—viz., in two papers circulating in the district once in each of four weeks. But the papers least likely to be read by investors were selected. The result was that no tenders were received, and the whole of the stock was left to be offered to the consumers at the reserve price, which was the full market value of the stock. They again took it all, and wanted more. The process has been repeated from time to time, and reported in the "Journal." The Company have about doubled their shareholding constituency, and some half-million of capital has been raised in this way; preference being given to applicants for small amounts. Mr. Livesey has made no secret of the matter; having explained the whole procedure more than once when the recent Bills promoted by the Company were in Parliament, and at other times. In the session of 1895, the Secretary of the Board of Trade supported the proposal in the Company's Bill; and the Committee of the House of Commons, while refusing the conversion of the stock, approved of its sale to consumers. In the Bill of 1896, the Committee sanctioned the conversion, but refused the power to offer the stock in the first instance to the consumers; giving as their reason privately that it was not necessary, seeing that the Company had, under their existing powers, attained the object in view. The *modus operandi* had been fully explained to this Committee, as

it had to that of the previous year. Power, however, was given in the 1896 Act to offer to the consumers and employees, as well as to the shareholders, at the reserve price, the stock that was not sold by auction or tender. Mr. Livesey has explained that this is different to inviting tenders from consumers, which is not successful, because, as a rule, they do not understand tendering. It is therefore necessary to success to make the offer of the stock in definite amounts—say £5 and multiples thereof—at a fixed price; and to this he attributes the successful placing of so large an amount of stock. Applications are always received for more than the total to be allotted. The notices are sent out with the gas bills, and a month is allowed for the sending in of applications.

Gaseous Firing.

SIR,—I am obliged to Mr. Carpenter for his reply to my letter of the 19th ult. I have examined the drawings reproduced by you, and must admit that I cannot see any special precaution taken in the designing to ensure the keeping down of the heat. I should be obliged if Mr. Carpenter would point it out to me. I quite agree with him that if the gas-ports are kept low down, the heat will be more even. But in fig. 1 of his drawings, they do not appear to be very low down; and I consider the hottest part of the flame would be at a point between the third and fourth retort. Of course, the flame must be much longer than shown, unless an excess of secondary air is allowed to pass into the setting; and this would not be economical. With a minimum of chimney draught, the greater portion of the combining gases must rise to the top of the setting, passing over the two top retorts and down the sides; and one would think that the greatest heat would be where the gas was first obstructed in its flow.

Mr. Carpenter admits that, under some conditions, the jet-pierced producer arch will give proper results. This being so, I do not see how it can be termed defective; because when a remedy is found and applied, the defect cannot still exist. To make the jet-pierced producer arch a success, is not a matter of loose bricks and tiles—a block to each gas and air inlet being all that is required; and once properly adjusted, it never requires altering. The fact of being able to erect a retort-setting with the producer directly underneath which will give the desired results, seems to indicate that there is no necessity to place it outside, and by so doing take up the space which should be occupied by another setting of retorts. This, of course, applies to both generator and regenerator furnaces. However successful Mr. Carpenter's method of heating the secondary air may be, there is no doubt that there is greater economy when this is heated by the waste gas that would otherwise heat the main-flue to a bright red heat.

The point to decide now seems to me to be whether the saving effected by regeneration is sufficient to warrant the extra expenditure. I believe that it is, because it is not only the saving in fuel (which in itself I consider sufficient), but a higher make per mouthpiece can be obtained, which means a greater producing capacity for a given ground space. The life of a properly constructed regenerator and producer is practically unlimited. If the lining of the producer receives proper attention, no other repairs are needed for many years; and therefore the cost of this portion of the setting may be spread over a much longer period than that of the retorts. There will thus be only a very little saving required to pay good interest on the extra cost of erection.

Mr. Carpenter mentions 4s. 3d. per mouthpiece as being the cost of the air-heating flues in his setting. This may be a very small amount; but it is not just the air-heating bricks in a regenerative furnace that make the setting expensive—the extra depth of walls below the floor-line and the construction of the producer must be taken into consideration. In the drawings reproduced by you, this part of the structure does not appear to be reduced in cost. In fig. 1, there is ample room under the setting for the construction of a producer and regenerator, which would give every satisfaction. In fig. 5, the wrought-iron tube lined with fire-brick must be a very expensive addition to the setting; and I should think this would cost almost as much as a separate producer for each setting. Then, in addition to this, there is the cost of the outside producer. With a setting of retorts 22 inches by 16 inches, eight in number, 21 feet through, blocked up in the centre for convenience in working, and making two 10 feet retorts in the 21 feet, with a producer and regenerator placed directly underneath, a make of 10,000 cubic feet per mouthpiece can be obtained; these retorts all being worked from the ground floor.

I do not consider that a gas-fired setting, either of six or ten retorts, set according to the design shown, is the most suitable for large and medium-sized works. Theoretically, a setting of six should take less fuel than a setting of eight. But in practice I find that it is very difficult to make any difference in the fuel consumption; and the through setting of eight is much more economical in proportion than the single setting of the same number.

Mr. Carpenter says that nostrils 1½ inches by 6 inches long are very suitable for a setting of six or ten retorts, with air-jets of the same size on each side. One cannot wonder at such narrow nostrils as these choking up. If they were three times the width, I consider they would work equally as well; and I venture to say they would not then choke up. If the flame spreads out as he suggests, I do not see any advantage in having such a large space between the retorts. It cannot be needed to ensure proper combustion.

If I am right in assuming fig. 5 of Mr. Carpenter's drawing to be one-eighth scale, fifteen settings of retorts, including the outside producer, would occupy a ground space of 169 feet by 20 feet, and with a make of 7000 cubic feet per mouthpiece would yield 2,100,000 cubic feet per diem. Fifteen settings of eight retorts would occupy a ground space of 163 feet by 21 feet, and with a make of 10,000 cubic feet per mouthpiece would yield 2,400,000 cubic feet per diem; these being all worked from the ground floor, saving the cost of thirty retorts and the expense of a travelling stage. If retorts five high heat satisfactorily, and are not awkward to work, why not set two more rows of three over the ordinary setting of eight—making a setting of fourteen? This would tend to economy in construction.

I thank Mr. Cleminshaw for his remarks; but I was not aware that the size of the works made any difference to the even heating of a setting of retorts.

Evesham, Dec. 9, 1897. PERCY H. FLETCHER.

Gas Workers' Superannuation.

SIR,—The subject-matter of Mr. Carter's letter in your last issue has been exercising the minds of my Directors for some time; but I cannot hear of any small works (the one I am connected with carbonizes only about 3000 tons of coal yearly) where a superannuation system is in operation. If Mr. Carter, either *suo motu*, or as the result of his inquiries, is able to formulate any feasible plan for rendering the old age of a hard-worked body of men free from anxiety as to their means of subsistence, and will publish the same in your columns, he will earn the gratitude of a large body of employees all over the kingdom, and the thanks of many who, like myself, are desirous of assisting in the adoption of a satisfactory scheme.

Dec. 10, 1897. SECRETARY.

The Collection of Gas Accounts.

SIR,—In the last number of the "JOURNAL" there appeared a paragraph relating to the collection of gas accounts at Longwood, near Huddersfield. Mr. Brearley is certainly to be congratulated upon the measure of success attending his efforts to secure payment within a reasonable time and to reduce the arrears to a minimum; and, judging from the prominence given to the announcement, it may, I suppose, be premised that this is an instance of the successful collection of gas accounts under the discount system. Whether or not this is the best system available is a moot point; and, with your permission, I should like to put the question, through the medium of the "JOURNAL," whether or not this is generally considered to be so. Personally, I consider it is not, and that there are two grave objections to the discount system as applied to the collection of gas accounts—viz., its comparative costliness, and its effect upon the initial rate charged for gas.

A 5 per cent. discount really means, with gas at 2s. 6d. per 1000 cubic feet, that the actual price is 2s. 4½d.; a 10 per cent. discount, 2s. 3d.; and so on *pro ratâ*. With the present tendency to reduce the price of gas to its lowest possible limit, and in face of the various competitors in the field, is it politic to adopt any system of collection that will place the initial rate charged for gas higher than it is in reality? Or, in other words, ought not the *net price* per 1000 cubic feet to be that with which the consumer is acquainted?

As to the cost of collection, nothing less than a 5 per cent. discount is, generally speaking, sufficient to induce consumers to bring in their accounts without the application of a little pressure; whereas, with a good collector, it may be done equally well—if not better—for 1 per cent. on the amount collected.

As it is essential for one to give some reason for the faith that is in him, particularly when calling into question the policy of others, I beg to submit a statement of the collection of our gas accounts at Grantham for the twelve months ended Sept. 30, 1897 (practically to date). I have taken twelve months, as including all the seasons, and as such a period is more representative and reliable, for purposes of reference and comparison, than any one quarter or half year.

The quarterly gas-rentals—exclusive of prepayment meters—were respectively as under:—

Quarter Ending.	Quarter's Rental.	Arrears after Collection.
Dec. 31, 1896	£3142 18 3	£0 13 5
March 31, 1897	2998 8 6	0 8 4
June 30, 1897	1483 14 10	Nil.
Sept. 30, 1897	1395 16 9	Nil.
Totals	£9020 18 4	£1 1 9

With the exception of the amounts entered under "arrears," the quarterly collections were completed by the following dates:—

December quarter,	1896	—Collection completed by	March 12,	1897
March	1897	"	June 10,	"
June	"	"	Sept. 7,	"
September	"	"	Dec. 4,	"

Of the arrears, 4s. 6d. has been recovered during the twelve months, and the balance (17s. 3d.) is being written off as bad debts. But, accounting for the 17s. 3d. as arrears still, it runs out, on the year's collection of £9020, to 2·3d. per £100.

The whole of the collecting at Grantham is done by one collector, who also assists in the preparation of each quarter's gas accounts. The actual cost for collecting runs out to only 0·88 per cent. (less than 1 per cent.) on the amount collected; leaving the price of gas (collected) per 1000 cubic feet practically as its true figure.

Our mode of procedure is as follows: The collector commences his rounds the first day of each quarter with the previous quarter's accounts, and continues his perambulations until he has called at least twice upon each consumer not paying at the first call. That done, the following notice is inserted in the leading local newspaper:—

GRANTHAM GAS COMPANY.

NOTICE.

All persons who have not paid their accounts for gas, coke, tar, &c., for the quarter ending.....last are respectfully requested to do so forthwith. Disregard of this notice may be attended with trouble and expense. (Signed).....

.....189 . Secretary and Manager.

Nine days are allowed to elapse after the publication of the newspaper containing the foregoing notice before any further steps are taken; and at the end of that time the number of unpaid accounts will be anything between 50 and 300.

Next the following notices, numbered respectively 1, 2, and 3, are sent out, in the order given, to those consumers who still hold aloof:—

[No. 1.]

MEMORANDUM.

Mr.....

To the GRANTHAM GAS COMPANY.

£ s. d.

Account rendered to.....

The above amount is requested to be paid immediately, at the Company's Office in High Street.

.....189 .

..... Secretary and Manager.

[No. 2.]
GRANTHAM GAS COMPANY.
NOTICE.

No.... ...
To Mr.....No.....Street.
I am instructed by the Directors of the above Company hereby to give you notice that unless, within *three days* from the time of delivery of this Notice, you pay to them the sum of £ : : due from you for gas supplied to your house and premises in.....proceedings will be taken for the recovery thereof without further notice.
Dated this.....day of.....189 .
... .
Secretary and Manager.

Grantham Gas Company's Office, High Street.
Office Hours—9 till 5.

[No. 3.]
GRANTHAM GAS COMPANY.

To.....
I am instructed by the Directors of the Grantham Gas Company to hereby give you Notice that unless, within *twenty-four hours* from the time of the delivery of this Notice, you pay to them the sum of £ : : , due from you for gas supplied to your premises in.....the Directors will cut off the service-pipe supplying such premises, and enter upon the said premises and remove the pipes, meters, fittings, and other works, the property of the Directors.
Dated this.....day of.....189 .
.....
Secretary and Manager.

Four days' interval is allowed between the sending of Nos. 1 and 2, and three days' between Nos. 2 and 3; the latter being promptly followed up by an inspector, duly armed, when necessary. Actually we have only had three such cases during the twelve months.

Such is the routine of our system, although it is varied to suit the "old stagers," who are favoured with notice No. 3 at the earliest possible opportunity after the appearance of the newspaper advertisement.

There will naturally be a few objections to the adoption of this system anywhere, as there would be to any system that tightened the reins; but my personal experience of it is that, once established, it is the means of obtaining the maximum of efficiency with the minimum of trouble and expense.

Grantham, Dec. 8, 1897. R. G. SHADBOLT.

Mr. Skinner's Article on Gas Distribution.

Since returning the revised proofs of the article which appeared in the "JOURNAL" last week (p. 1239), Mr. Skinner has found a few errata which he asks us to correct. They are as follows:—

$\frac{d^2 \times \sqrt{d}}{\sqrt{2}}$	should be	$\frac{d^2 \times \sqrt{d}}{\sqrt{l}}$
$\frac{d^2 \times \sqrt{d}}{d_2^1 \times \sqrt{d_1}}$	"	$\frac{d^2 \times \sqrt{d}}{d_1^2 \times \sqrt{d_1}}$
$\frac{\sqrt{d_1}^5}{\sqrt{d}^5}$	"	$Q \times \frac{\sqrt{d_1}^5}{\sqrt{d}^5}$
πd^2	"	$\frac{\pi d^2}{4}$
$d^2 \times \sqrt{d}$ or $\sqrt{d}$	"	$d^2 \times \sqrt{d}$ or $\sqrt{d^5}$

Wokingham Corporation Gas Supply.—The annual report of the Gas Committee of the Wokingham Town Council was submitted at the last meeting. It showed that there had been a substantial advance in the receipts through an increase of 880,000 cubic feet in the consumption of gas. Notwithstanding this, there was a deficit of £136 on the revenue account, arising from the extraordinary expenditure of the year. A temporary loan of £700 had been repaid, two new benches of retorts had been fitted up, coal had cost more, and an outlay of about £116 had been incurred in litigation.

Issue of New Capital by the Hartlepool Gas and Water Company.—A special meeting of the Hartlepool Gas and Water Company was held last Thursday for the purpose of authorizing the Directors to issue further capital. The Chairman (Mr. W. H. Fisher, J.P.) stated that the capital of the concern was £349,170; and the whole had been allotted, excepting £25,830. He moved that 2150 new shares of £10 each should be issued under the provisions of the Company's Act of 1878, and that the new shares, representing water capital, should be allotted to the present shareholders at par in the proportion of one new share for every sum of £135 capital now held. This was agreed to, as was also a motion that the remaining unallotted shares should be sold by auction.

The Public Lighting of Plymouth.—The Works Committee of the Plymouth Corporation have entered into a provisional arrangement with the Gas Company to take over control of the lighting of the streets. At present the Company own the lamp columns and brackets, and are responsible for the lighting. In view of the changes which will be introduced by the lighting of some of the streets by electricity, it was thought desirable that the Corporation should have the whole arrangements under their charge. Mr. C. R. Bellamy, the Lighting Superintendent of the Liverpool Corporation, was consulted, and the result of his negotiation is an arrangement which now only requires formal confirmation by the Town Council and the Directors of the Gas Company. The latter are to hand over to the Corporation all the columns and brackets in use on the 31st inst. for the sum of £2500; the lanterns to be returned to the Company when thrown out of use. At any date convenient to the Corporation, the lighting, maintenance, &c., of the public lamps throughout the borough are to be handed over to their control. As to the gas required for the lamps, it is arranged that it shall be supplied by governor and regulator measurement, in accordance with a schedule of hours to be provided by the Corporation, and in general conformity to the conditions of the Gas-Works Clauses Act, 1871. The price is the same (1s. 9d. per 1000 cubic feet) as that charged to the ordinary consumers, less a discount of 5 per cent. The Corporation propose to obtain a loan of the capital sum required for the purchase of the columns and brackets.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

Monday, Dec. 6.

(*Before Justices* HAWKINS *and* CHANNELL.)

Driscoll and Wife v. Poplar District Board of Works.—Damage to Gas Mains by Steam-Rollers.

This was an appeal by the defendants from a decision of Judge French, at the Bow County Court, awarding the plaintiffs, Mr. and Mrs. Driscoll, £50 damages for injuries sustained by them through an explosion of gas, which was attributed to the defendants' negligence.

Mr. LAWSON WALTON, Q.C., and Mr. ABINGER appeared in support of the appeal; Mr. W. M. THOMPSON represented the respondents.

Mr. LAWSON WALTON submitted that there was no evidence on which the County Court Judge could properly find that the appellants had been guilty of any negligence leading to the injuries sustained by the respondents. Daniel Driscoll and his wife were tenants of a house in a street in the defendants' district, where an examination was taking place of the drains and sewers. With the view of testing the efficiency of the drainage, a rocket apparatus was employed by the Sanitary Inspector; and, owing to the presence of gas in the sewer, an explosion took place by which the respondents were injured. At the outset, the action was brought alternatively, either against the Board of Works or against the Commercial Gas Company, whose mains lay under the surface of the road where the accident took place. The case originally presented by the plaintiffs was, first of all, that the accident was due to an explosion of gas which got into the drains owing to the Company allowing it to escape from their pipes, or owing to the negligence of the Board of Works in breaking the gas-main by the use of steam-rollers. The action was originally framed on that alternative; and summonses were taken out. But the Judge decided that the plaintiffs could not sue both the Company and the Board of Works in one action; and he put them to their election. Fortunately for the Company, they decided to abandon their case against them, and to confine the action to the one against the Local Authority. The negligence alleged was that they had used an unduly heavy steam-roller in the process of repairing the street, with the consequence that the gas-pipe was broken, and the gas escaped into the drain, which caused the explosion. It was urged that there was no negligence in the use of the steam-roller; that it was a proper roller for the purpose; and that if the main had been laid at a sufficient depth, and the soil surrounding it had been in a proper condition, the roller could not have broken it. It was likewise contended that the gas had escaped from other causes; and there were minor issues disposed of by the Judge in the Court below.

Justice HAWKINS said he thought Counsel was under a misapprehension as to what the learned Judge had found. He found there was negligence in the use of the steam-roller.

Mr. LAWSON WALTON said the Judge had found that the gas-mains were properly laid, having regard to ordinary street traffic; and that the fracture was caused by the negligent user of such a heavy steam-roller, that the gas escaped into the sewer on account of the defective condition of its brickwork, and that therefore the Board of Works were liable. The appellants wished to raise the question whether, on the evidence before him, the Judge was warranted in finding that there was a breach of duty on their part. In the first place, was there a breach of duty on the appellants' part in not knowing the position and the depth of the gas-main, and the character of the soil surrounding it; and, secondly, was there any breach of duty in using a steam-roller which was acknowledged to be perfectly proper for the purpose, assuming that the main was supported by sound earth. The facts admitted by the plaintiffs' chief witness—the Engineer of the Commercial Gas Company (Mr. Henry E. Jones, M.Inst.C.E.)—were that the main in question was laid forty years ago, and that it had never been touched from that time until recently, when it was found to be broken in half. This witness said that the pipe was rusted, but that, if the subsoil had been firm, no amount of weight would have broken it. This raised the important question for a public authority—whether they were under any obligation to ascertain what might be the condition of the soil surrounding the gas-main after a considerable lapse of time, and whether the Gas Company were in a position, after the lapse of forty years, without ever having examined the condition of the mains, to tax the District Board with breach of duty because they passed over the surface of the road a steam-roller which would not have caused any injury if the main had been properly supported, but which turned out to be altogether too heavy having regard to the fact, unknown to them, that the mains were not properly resting on the subsoil. The District Board were entitled to assume that the Gas Company from time to time examined their mains, and saw that they were properly supported and laid. If they did not do this, it was a breach of duty on their part; and any consequent accident was properly chargeable against them. It was still open to the appellants to argue that, if it was the fact that the subsoil was in a defective condition, judgment should be entered for them, notwithstanding that it was found that the fracture was caused by the steam-roller, and that the pipe was properly laid in the first instance. He then wished to read the shorthand notes to show that the Judge's note, which was supplied to the Court, was imperfect, in that it did not state that the plaintiffs' principal witness admitted that he had examined the subsoil, and found it defective, and that this was the reason why the pipe became fractured.

Justice HAWKINS held that, by reason of the fact that the Judge had furnished a note, the shorthand writer's notes could not be referred to, unless special application had been made previous to hearing the appeal.

Justice CHANNELL asked how the appellants got over the finding of the County Court Judge that the gas escaped into the sewer on account of the defective condition of the brickwork.

Mr. LAWSON WALTON said that was not the negligence charged. It was the breach in the main that caused the accident.

Mr. THOMPSON said the defendants at the trial called all their witnesses to prove, not that the road was in a defective condition, but that some time prior to the steam-roller going over the ground, an escape of gas had been discovered. Their own Engineer had said that the accident was caused by a flaw in the pipe; and the point as to the alleged insecure condition of the soil was never raised until they came to that Court.

There was ample evidence on which the Judge could find that the gas-main was properly laid, and that it was fractured by the steam-roller.

Mr. LAWSON WALTON said that, having regard to the fact that it was customary now to consolidate macadamized roads by means of a steam-roller, the Gas Company were bound to anticipate its use, and to lay their mains in such a way as to withstand the pressure arising therefrom.

Their LORDSHIPS dismissed the appeal; holding that there was ample evidence on which the County Court Judge could come to the conclusion he had done.

The Incandescent Gas-Light Company's Patents.

In the Court of Appeal, on the 6th inst., Lords Justices A. L. Smith, Rigby, and Collins had before them the case of *The Incandescent Gas-Light Company, Limited, v. The New Incandescent Gas Lighting Company and Lefroy*. It was an application *ex parte* by Mr. Carrington for leave to appeal from an order of Mr. Justice Day, in Chambers. He said that an injunction was obtained by the plaintiffs restraining the infringement of their patents. Subsequently an application was made to commit the defendant Lefroy for a breach of the injunction, which came before Mr. Justice Grantham in Chambers on the 29th of June, when he did not make any order on the summons, but gave liberty to apply in case there should be any further cause of complaint. Since then an application had been made to Mr. Justice Day in Chambers to commit the defendant Lefroy; and in support of it an affidavit was filed, the greater part whereof was only hearsay. Thereupon the learned Judge decided to go into the whole matter of the former summons, under the liberty to apply, and ordered that the defendant should attend to be cross-examined on any affidavit he might put in. His contention was that the plaintiffs' witnesses ought to be cross-examined to ascertain if there was any case really made out, before he was himself cross-examined to see if anything could be obtained from him tending to criminate himself. After some discussion, their Lordships refused leave to appeal.

The Sheffield Corporation and the Sheffield Electric Light and Power Company's Undertaking.

In the Chancery Division of the High Court of Justice last Tuesday, Mr. Justice North gave his decision in an action brought to determine the mutual rights of the Sheffield Corporation and the Sheffield Electric Light and Power Company, Limited, in respect of one of the powers given by the Company's Provisional Order for the Corporation to purchase their undertaking. Briefly, the nature of the action was that the Corporation had power to purchase the Company's undertaking, and they had to pay for it by an issue of stock of such a nature as to produce, from the interest or dividend thereon, an annuity of 5 per cent. on the sum that had been expended by the undertakers. The defendants said that, according to the construction of the statute, the stock must be irredeemable—that was to say, the undertaking could not be paid for in stock which the Corporation had power to redeem in twenty or thirty years. They averred that on the same day as that on which the statute took effect, an Act was passed which deprived the Corporation of the right to issue irredeemable stock. The Corporation, on the other hand, said the two Acts must be read together, and that the power conferred by the one could not be taken away by the other. They contended that they had authority to issue irredeemable stock for the purchase of this particular undertaking, though their general power to do so was taken away. Mr. Swinfen Eady, Q.C., led for the Corporation; Mr. Cozens-Hardy, Q.C., for the Company. The arguments were concluded on the 4th inst. His Lordship dismissed the case, but without prejudice to any action the Corporation might think fit to take if they were able to transfer to the Company irredeemable stock.

Unlawfully Using Water for other than Domestic Purposes.

At the Altrincham Petty Sessions yesterday week, Messrs Oram and Evans, fishmongers, were summoned, at the instance of the North Cheshire Water Company, for using water for other than domestic purposes. Mr. Bradbury, for the complainants, stated that the case raised a question of great importance. The defendants were the occupiers of two lock-up shops in Altrincham; and up to June of this year, they had water supplied for other than domestic purposes. Owing to the excessive use of water by defendants, the Company thought that it ought to be supplied by meter, and gave notice accordingly, at the same time stating that the minimum charge for each shop must be 10s. per quarter, and also enclosing a scale of charges for water-meters. Defendants refused to agree to the terms unless the Company fixed the meters at their own cost. He had to point out that there was no obligation on the Company to supply water for other than domestic purposes; and accordingly notice was given in August to the defendants that if, after Sept. 29, water was used by them other than for domestic purposes, proceedings would be taken, but that the Company were open to supply on the usual terms and conditions. The defendants replied that they were willing to sign an agreement if the terms were satisfactory; but they had not done so. Mr. H. Barratt, the Secretary of the Company, gave formal evidence as to the water having been used for other than domestic purposes. Mr. Wragg, on behalf of defendants, complained of the high-handed position taken by the Company in this case. They were contractors just the same as anyone else to supply a certain article; and they had power to make an agreement. The Act stated that they had power to supply meters on hire, and that the rate could in case of disagreement be fixed by two Justices; and he contended they ought to have adopted this course. As it was, the notice was absolutely unreasonable, and would in the case of the defendants put a stop to their business. They were entitled in any event to three months' notice; but here under the notice they could do nothing unless they bowed to the Company, and signed an agreement. Mr. Bradbury pointed out that the Company had not discontinued the supply; so that there was nothing in the remark that the defendants' business would be stopped for want of notice. He pressed for a small penalty. The Bench fined the defendants 10s. and Court costs; the Chairman (Mr. R. H. Joynson) remarking that they could not, under the circumstances, grant Counsel's fee.

MISCELLANEOUS NEWS.

THE PROPOSED NEW SITE FOR THE EDINBURGH AND LEITH GAS-WORKS.

Reports by Mr. W. R. Herring and Mr. G. Livesey.

The following reports upon the question of the site for new gas-works for Edinburgh and Leith, for the construction of which authority is to be sought next session, have been submitted to the Gas Commissioners by Mr. W. R. Herring, their Gas Engineer, and Mr. George Livesey.

Mr. Herring's Report.

Leith Site.

Prior to formulating the scheme which was laid before you in my report of the 6th of September last, I had very carefully considered the possibilities of utilizing the available land adjoining the Baltic Street Gas-Works at Leith; and, after duly considering it from all points of view, I was forced to the conclusion that it would not be wise to lay out further capital expenditure on this site. In the first place, it would simply be deferring for a few years the day when the main question of the transfer must be taken in hand. In the second place, it would only be possible to put down a manufacturing plant at this station; and as a large gasholder is urgently needed, land would have to be acquired for this purpose. The physical formation of the site is also against its utilization for a modern gas-works plant. The substratum is water-logged sand for a depth of from 10 to 15 feet from the surface, at which level a very secure foundation could be secured. But in addition to the enormous cost of running heavy foundations down to this level, which, for the plant in question, would probably amount to the full value of the land, the water-level is so high that drainage operations would have to be carried out; and, apart from the difficulties and consequent cost of such an operation, I should have grave fears of rendering unstable the foundations of neighbouring buildings and properties by the running of the sand during the pumping operations on the site in question. For these reasons, I cannot advise the utilization of this land for gas-works purposes; and I have no doubt you will realize its full value whenever you are disposed to sell it.

Fillyside and Granton Sites.

I find upon inquiry that the owners of the above sites are agreeable to the principle of the lands in question being used for gas-works purposes. I therefore proceeded to make a careful study of the respective sites, and have the following facts to lay before you with regard to their relative advantages. The Fillyside site is situated in such a position that the North British Railway at present touches one boundary; and the projected new line of the Caledonian Railway, which is to be laid to the New Dock at Leith, can be coupled to it on the opposite side of the boundary. These two lines of railway would give us direct communication with the Leith Docks; and I have ascertained from the Railway Companies that the rate for traffic over this length of line will be 3s. per waggon.

The Granton site has the Caledonian Railway on the one boundary; and arrangements have been made with the owners of the Harbour Railways at Granton for the use of their railways for the gas-works traffic, either transferred from the North British Railway, which terminates at a point near the Granton Hotel, or to and from the harbour. In consideration of this privilege, a charge of 2d. per ton was asked, which is equal to an average of £2000 per annum, on the first twenty years only. But, after due negotiations, it has been arranged that the Commissioners should pay a sum of £75 per annum as a fixed and only charge towards the maintenance and upkeep of the railway lines in question; and it has been further agreed that, in the event of terms being arranged, a new branch railway is to be laid through the Caroline Park Estate at the cost of the owners, by which means the site would be approached from a more convenient direction. In addition to this, the Commissioners would be saved the cost of the construction of the branch line up to the western boundary, as the new line will come in at a point where it will become immediately available for traffic purposes, and in close proximity to the Caledonian sidings. The gradient will also be more suitable for working. Before leaving the question of traffic communications, it would be as well to point out that in the case of the Fillyside site we are dependent upon the Railway Company for communication to the harbour; while with the Granton site the harbour communications to the works are private railways. The advantages of this are worthy of note. Railway strikes and such like possibilities could in no way interfere with the traffic to and from the works and harbour; and in the event of colliery strikes, we could be sure of supplies of seaborne coal without the danger of the railway men combining with the colliers to prevent the traffic in question.

The Fillyside site is, from a physical point of view, not so advantageous as the Granton site, as approximately one-half of the former is low-lying ground, and would doubtless entail considerable expenditure in securing suitable foundations for the plant that might be placed thereon. Its locality is also likely to be objected to by a larger number of residents and land-owners that can object to the Granton site. Its distance from the distributing station of Canonmills is, however, exactly the same as the distance from the Granton site. The physical formation of the Granton site can be dealt with to great advantage; and from inquiries I have made, I do not anticipate any trouble in securing suitable foundations at a moderate depth below the surface. Its slight inequalities of level is also capable of being turned to advantage particularly in the construction of gasholder tanks, which, instead of being sunk to their full depth of about 50 feet in the ground, can be raised above the present level, and surplus earth arising from foundations, &c., used to form an embankment round the upper part of the walls thereof.

Commercial Advantages.

Taking the Fillyside site as the basis of comparison, the Granton site possesses the following advantages over the former. The fact of the railways communicating between the harbour and the works being in the hands of a private owner, whose direct interest is to encourage the harbour traffic, it will prevent the Railway Companies from combining and imposing such rates for the short-distance traffic as will maintain the traffic on their railways, and thus render the harbour of little

advantage. On the one hand, we shall have the Railway Companies competing between themselves for our traffic on rail, and the two of them jointly competing for the traffic by water. Such a combination of conditions cannot be rivalled, and should in itself prove of great value in the course of years.

There is a tip for the whole of the refuse from the works, for a period of at least ten years, and in all probability for a much more lengthened period. There will be no traffic dues to pay on goods in transit to and from the harbour for shipment, as compared with 3s. per waggon for the Fillyside site. Its locality is such as to be the least inconvenient to the general public, either in the present or the future. Arrangements have been made with the North British Railway Company, whose line terminates at the Granton Hotel, for them to run the Gas Commissioners' traffic over the harbour railways on to the gas-works' site free of charge. They also agree that there shall be no increased rate for conveying the traffic the additional distance, but that the prevailing rates to Edinburgh and Leith shall hold good for delivery at Granton. These combined advantages possess considerable monetary value, and should be duly considered when arriving at the relative value of the respective sites.

Oct. 22, 1897.

Mr. Livesey's Report.

Yesterday, in compliance with your request, I spent the day in Edinburgh and Leith making the necessary inspection to enable me to report on the proposal of your Engineer, Mr. Herring, that a new site should be selected for the purpose, in the first place, of making the necessary extensions of plant to meet the continually increasing demand for gas, with the ultimate object of transferring thereto such portions, or the whole, of the existing works as may from time to time appear necessary or advisable.

The first question asked me is whether further extensions should be made on the vacant ground at Baltic Street. My answer is most emphatically "No." It is not of the slightest use thinking of making extensions there, unless with the object of pulling down the existing works entirely and making a new and complete whole. That being so, it would certainly be better to make the necessary new works on a better site, with better railway facilities, where their construction would be less costly, and where they could be more spread out, which would result in cheaper and more efficient working. I never like to destroy existing plant. But anything like really good results are certainly unattainable without entire reconstruction; and that being so, it ought to be carried out on a more suitable site.

The next question is whether the New Street works should also be transferred, to which my reply is, "Yes, ultimately"—that is to say, as soon as new works can be built, they should relieve New Street at once of part of its work, to enable the work there to be done as economically and efficiently as the circumstances will permit. I have no doubt that, when the new works get into fair going order, the saving will be such that no time will be lost in transferring the remainder.

As to the possible monetary savings that can be obtained by removal, it is hardly practicable to speak with exactitude; but there is no difficulty in making an estimate on the safe side that will show a certain saving sufficient to do more than pay interest on the probable outlay. To begin with carbonizing wages, we have found, either by machinery or preferably by the use of inclined retorts, at the South Metropolitan works that 1s. 6d. per ton of coal, or (say) 2d. per 1000 cubic feet of gas made, is more than sufficient. The carbonizing wages at Edinburgh and Leith, by last year's accounts, amounted to 4s. 6d. per ton, or 5¾d. per 1000 cubic feet; but these figures have been somewhat reduced during the last three months, though they may rise again as the winter advances. At any rate, a saving of at least 2d. per 1000 cubic feet can be effected on this item alone, which, on the present make, would amount to £13,000 a year—a sum sufficient to pay interest and sinking fund of (say) 4 per cent. on £325,000. Further, I should be very greatly surprised if another 1d. per 1000 cubic feet could not be saved by the convenient arrangements that could, and would, be made for general working on a new site, as against the extremely inconvenient and expensive working at the present crowded and necessarily awkwardly arranged works at Leith and Edinburgh. This would bring up the saving to at least £20,000 a year, which would pay interest and sinking fund at 4 per cent. on half a million of money. I have, therefore, no hesitation in advising removal by degrees.

Further, there is, in my opinion, no option on the question of a new site. Edinburgh and its surroundings are rapidly increasing in population; and more gas must be provided. I find the consumption has rather more than doubled in the last twenty years; and in the last seven it has increased 32 per cent., or about 4 per cent. compound annually on the average. Last year it was over 5 per cent. Consequently, in preparing for the future, it would not be safe to estimate for a smaller increase than 4 per cent. per annum. At this rate, the consumption will double in about 17½ years; and the question arises, How is this probable demand to be met? Suppose there is a 4 per cent. increase for the next seven years only, which would mean an increased output of gas of one-third over the present make, how can this be met otherwise than by erecting additional plant on a new site? I do not like to say that anything of the kind is impossible; but to increase the make by one-third on the existing sites would, if it could be done, necessitate a very heavy outlay and very expensive working. And then, if it were done, and the demand for gas continues increasing—as there is every probability will be the case—what next? I have seen a serious proposal, illustrated by complete explanatory plans for a three-storeyed gas-works—or rather, I think, four storeys, including the basement, which was to be used for tar and liquor tanks, then the purifiers, and above them the retort-house, and, to crown all, the gasholder on the top. This was one of the competitive plans submitted to the late Mr. Thomas Hawksley, Mr. King, and myself, for new gas-works at Manchester twenty years ago. We did not advise its adoption; but I should have to suggest it for your consideration if you should determine to struggle on at the present sites.

The best method that can be adopted, after proper manufacturing arrangements have been made, for cheapening the price of gas, is to increase the consumption. This you are not in a position to do with your crowded works. Instead of trying to induce the public to use more gas, you are in the unfortunate position of being compelled to restrict its use, which is bad in every way. Again, therefore, I say there is no option. The necessary additional works must be erected on a new site.

That being so, the site must be large enough for the entire make for (say) forty years, and to enable the transfer thereto of the manufacture from the existing works as may be found necessary or advisable. For this purpose, the Granton site is unquestionably the best that has been brought before me. It is not only better than any of the others, but it is in itself what I consider an admirable site both as to position and the possibility of constructing thoroughly satisfactory works.

I agree with Mr. Herring that gas-works capable of making 5 million cubic feet a day can be constructed for £225,000. Judging from our experience in constructing similar works, there is no fear of that figure being exceeded. A gasholder to contain 5 million cubic feet can be built for less than £50,000. The first one of that size that was ever constructed cost £47,000 at our works; and I could design another that would not cost more than £40,000.

As to a retort-house for that output, it is impossible to say what it would cost without seeing the plans. The South Metropolitan Company, however, have built their stage-houses for 450 retorts, worked by machinery, and producing more than 5 millions a day, for less than £50,000 apiece. Retorts and gasholder are the chief items; and these being provided for out of the £225,000, there remains ample for everything else.

I think it would be both safe and wise to take 5 millions as the unit for your new works; adding section after section as may be found necessary or advisable.

If units of (say) 2½ or 3 millions were adopted, they would be proportionally somewhat more expensive.

Being desirous that you should get this report on Saturday, I have not time to re-write and shorten it. I should have liked to follow the example of Sir William Arrol, who, when asked by the Corporation of Glasgow for a report on a certain old bridge, simply and concisely said, "Take it down." In like manner, I would say, Secure your site and build your new works as soon as possible.

Nov. 5, 1897.

Telegram received, Nov. 8, *from Mr.* Livesey.

Add to report: The capital of the undertaking is very low; also machinery cannot be used to best advantage in ground-floor retort-houses, like New Street. Also correct statement about four storeys. The Manchester plan was: Basement, tanks; ground floor, purifiers; top floor, retorts. Adjudicators suggested gasholders on top.

EXTENSION OF THE MANUFACTURING PLANT AT THE CHORLEY GAS-WORKS.

The extensions and additions which have lately been carried out at the Chorley Gas-Works were inaugurated on the 3rd inst by a special visit paid to the works by the Mayor (Mr. B. A. E. Jackson), the Gas Committee, and other gentlemen, including Mr. John West, of West's Gas Improvement Company, Limited, and Mr. Drake, of Messrs. Jonas Drake and Sons. The extensions consist of an installation of stoking machinery with all the necessary coal breaking, elevating, and conveying appliances, all of which have been supplied by the above-named Company. A new bench of 48 retorts upon the regenerative principle has been erected by Messrs. Drake; and the coal storage has been increased from 300 tons (five days' supply) to 3000 tons, equal to a supply for 3½ months. The whole of the arrangements have been carried out under the supervision and advice of the Corporation Gas Engineer and Manager (Mr. J. M'Cubbin); and the works are now, with these additions, in a very efficient condition. The new machinery, which had been working for some days very successfully, was inspected; and several retorts were charged by the Mayor, the Chairman of the Gas Committee (Mr. Critchley), the Vice-Chairman (Alderman H. N. Whittle), and Mr. Stone, all of whom expressed their surprise and satisfaction at the ease and smoothness with which the machinery worked. After the inspection of the works, refreshments were partaken of in the Manager's office. During the proceedings, the Chairman expressed himself highly satisfied with the inspection, and said he should now be able to recommend machinery to towns which at present lacked the means of economically manufacturing gas. He also said that their Manager deserved to be complimented for the extra exertion he had displayed in connection with the alterations; for to him it had been an anxious time. Mr. West, in the course of a short address, said that the men, now that they were used to it, were very pleased with the new machinery, and would not desire to return to hand charging. He had never advocated reducing the men's wages; on the contrary, by the use of the machines, corporations could afford to pay reasonable wages, and to give men the same amount for doing the lighter as for the heavier work. Mr. Drake also congratulated the Corporation and the Gas Committee on the economical enterprise they had shown. Mr. M'Cubbin said it was a great satisfaction for them to know that they could now manufacture 20,000 cubic feet of gas more per day than by the old abandoned system; and he was proud to say that they had as able a body of men as were to be found in any gas-works in the kingdom.

Public Lighting by Denayrouze Burners.—The Denayrouze system is being gradually extended for public lighting. It has already been adopted on a fairly large scale at Richmond and Oxford; and the General Manager of the Denayrouze Syndicate (Mr. C. E. Masterman, Assoc.M. Inst.C.E.) has just put up at Burslem a number of lamps and lanterns, including groups of eight and five burners, which are giving much satisfaction to the inhabitants.

The Damage to Gas-Works by Flood.—In the "Journal" last week we recorded the damage done to the Felixstowe Gas-Works by the great gale of the 28th ult. The works were exposed to the boisterous weather prevailing last Tuesday night and early on the following morning; but fortunately no further injury resulted. The town was still in darkness last Wednesday; but the works had been cleared, and operations commenced for the restoration of the lighting. The Rochester Gas-Works, which, it will be remembered, were inundated by the recent flood, have been freed from the water; and the difficulty of keeping up the necessary supply of gas no longer exists.

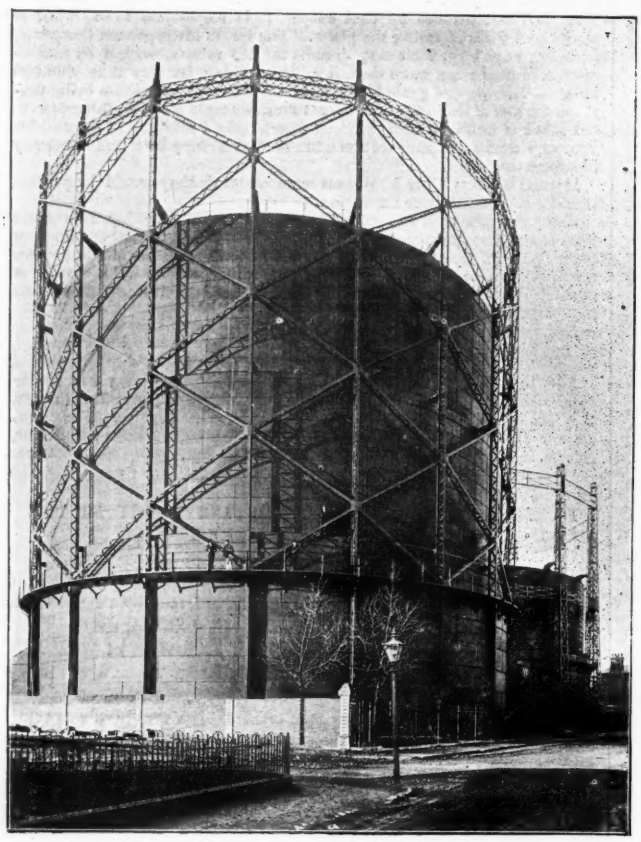
ADDITIONAL STORAGE AT THE IPSWICH GAS-WORKS.

Inauguration of a New Holder.

Our readers may remember that, in connection with the report of the proceedings at the last meeting of the Eastern Counties District Association of Gas Managers, we gave some particulars as to the progress of the Ipswich Gas Company. It was then stated that some few years ago a scheme was prepared by the Company's Engineer and Secretary (Mr. J. T. Jolliffe) for a general extension of the plant, so as to bring it up to a productive capacity of 2¼ million cubic feet of gas per day. It may be mentioned, as evidence of the necessity for this extension, that during the decade in which the management has been in the hands of Mr. Jolliffe, there has been a very largely increased demand upon the plant. This is shown by the following figures: In 1886, the quantity of coal carbonized was 14,587 tons; while the gas made was 151,680,000 cubic feet, of which 139,997,000 cubic feet were accounted for. In 1896, 23,568 tons of coal were carbonized, from which 239,367,000 cubic feet of gas were made, and 225,727,000 cubic feet were accounted for. In the present year, the increase up to the end of September was 13,400,000 cubic feet, or at the rate of 8·63 per cent. The extension scheme, of course, included the provision of additional storage; but before any steps were taken in this matter, considerable attention was given to the three systems of gasholder construction now in use. After a personal inspection of examples of spiral-guided and rope-guided holders, it was decided to erect one with guide-framing. Plans were prepared by Mr. Jolliffe; and the contract was placed in the hands of Messrs. S. Cutler and Sons, of Millwall. It comprised the erection of a holder capable of containing a million cubic feet of gas, working in a tank constructed above ground. The site of the holder was a very treacherous one; it being necessary in places to excavate the ground 15 feet deep, and fill in with nearly 2000 yards of cement concrete. This important work was carried out by Mr. Jolliffe's own staff and men; and when the members of the Eastern Counties Association visited the works in September, the tank was finished and the framing of the holder, which is designed on Messrs. Cutler's patent system (the diagonals acting as both ties and struts), was up. The work was completed in due course; and the holder was brought into use for the first time on Monday last week. The diameter of the tank is 122 feet, and its depth 32 ft. 6 in. The holder is in three lifts, respectively 120, 118, and 116 feet in diameter, and 32 feet deep. The extreme height to the top of the crown is nearly 140 feet. The structure is of mild steel.

The ceremony of turning on the gas from the holder into the town was performed by the Chairman of the Company (Mr. G. A. Biddell) in the presence of the Vice-Chairman (Mr. D. Ford Goddard, M.P.), the Directors and officers, the principal local officials, and the Secretary (Mr. J. H. Troughton, of Newmarket) and several members of the Eastern Counties Association, of which Mr. Jolliffe is President. An inspection of the holder, which was almost full of gas, having been made, the party, together with practically all the workmen, assembled in the meter-house, where the Chairman delivered a brief address. He explained that they were there by invitation of Messrs. Cutler, to inaugurate the new holder which they had satisfactorily completed, the erection of which had been necessitated by the constant and steady increase in the consumption of gas. Last winter the Company were put to some inconvenience owing to want of sufficient storage; and without increased gasholder capacity they would this winter have been in a still worse position. Already, during the past three months, the output had exceeded that of the corresponding period of last year by more than 3 million cubic feet, or nearly 5 per cent. Having given some details of the holder, as already set forth, he went on to say that the Directors were assured that they had a really sound piece of work, which reflected the very highest credit upon the designer and erectors. The recent great gale came upon the structure on the eve of its completion, and upon its most exposed side, when the holder was fully inflated with air; and it stood this severe strain most satisfactorily—in fact, like a rock. Moreover, its appearance was more pleasing than was usual with this class of engineering work, though it was feared that many of the public would not look upon it as "a thing of beauty." To the Directors, however, it appeared as a monument of skill, usefulness, and progress; and they trusted it would be "a joy," if not "for ever," yet for many years, and always be associated with the names of those who had designed and erected it. Mr. Cutler had presented him with a chaste and beautiful golden key, with which he would release a valve and declare the holder in use for the increase of light, heat, and comfort to the Ipswich public generally, and he trusted also for the continued and increasing prosperity of the Company. The Chairman then unfastened the padlock, turned the valve, and said: "Away go light and comfort over the whole of the town." Three hearty cheers having been given, the Chairman invited the workmen to a dinner on Wednesday evening.

The party were then conveyed to the Company's offices, where, at the invitation of Messrs. Cutler, they partook of luncheon. Mr. S. Cutler presided, and Mr. Jolliffe occupied the vice-chair. After the loyal toast, Mr. Biddell proposed "The Health of the Chairman," and in so doing emphasized his previous remarks as to the excellence of the work just completed by his firm, which he said had been carried out under adverse circumstances, owing to the serious dispute in the engineering trade, but nevertheless had been finished fairly well to time. Mr. Cutler, in responding, expressed his satisfaction at finding that the holder had passed unscathed through its "baptism of wind" during the recent gale. He acknowledged the kindness the contractors had received throughout the work from Mr. Jolliffe, his assistant (Mr. F. Prentice), and those who were associated with him. He proposed "The Ipswich Gas Company," and wished the undertaking long-continued prosperity. Mr. Biddell briefly responded. The toast was also acknowledged by Mr. Goddard, who spoke of the progress of the gas-works since he first knew them, in his childhood. He said the history of the Company could not be better marked into degrees than by the erection of gasholders; and he believed the progress made would be continued, because they were always having new developments. The Company had a worthy Chairman at the head of affairs, and an excellent Engineer and Manager in Mr. Jolliffe, who kept thoroughly abreast of the times. The other toasts were "The Health of Mr. Jolliffe," "The Mayor and Corporation of Ipswich," and "The Visitors;" the last being acknowledged by Mr. H. S. Pike, of Colchester, and Mr. W. D. Child, of Romford.



THE NEW THREE-LIFT HOLDER AT THE IPSWICH GAS-WORKS.
Constructed by Messrs. S. Cutler and Sons, Millwall, London.

Dimensions:
Tank.—Diameter, 122 ft.; Depth, 32 ft. 6 in.
Holder.—Diameter of Outer Lift, 120 ft.; Middle Lift, 117 ft. 9 in.; Inner Lift, 115 ft. 6 in.; Depth of each Lift, 32 ft. Height, 1 .0 feet. Capacity, 1,000,000 cubic feet.

GAS-WORKS EXTENSIONS AT CHESTERFIELD.

Local Government Board Inquiry.

The Chesterfield Gas and Water Board having applied to the Local Government Board for sanction to borrow £15,000 for gas-works purposes, Colonel W. L. Coke attended at the Municipal Hall, last Wednesday, to receive evidence with reference to the objects of the loan. The Town Clerk (Mr. J. Middleton) explained that the area over which the Board had jurisdiction contained an estimated population of between 46,000 and 48,000. The Board took over the concern in March, 1896, at a price settled by arbitration, equivalent to about 22 years' purchase; and the area of supply was the same now as under the old Company. The gas-works were erected in 1822, and enlarged in 1865. Ten years later—in the year 1875—the old Company built a very elaborate retort-house, in which, however, no retorts were ever placed. It was now proposed to fit up half this building, in order to cope with the constantly increasing demands that were being made upon them for gas. On taking over the concern, the Board made a reduction in the price of gas, both for private and public use. The old Company were entitled to charge private consumers 4s. per 1000 cubic feet, and 3s. 3d. for public purposes; and they charged the maximum under both heads. The present prices were 3s. 6d. and 3s. respectively, with liberal discount when the consumption was large. The demand for gas had grown month by month, until it now exceeded the supply. For the purposes of the gas undertaking, they were entitled to borrow up to £30,000; and this was the first application for a loan. He believed the time would soon arrive when the other half of the retort-house would be required to meet the increasing demand for gas. The portion now to be fitted up would be furnished with the most modern type of plant, so as to manufacture good gas cheaply. In reply to the Inspector, the Town Clerk said the Corporation had electric lighting powers, but no installation of a public character. The Engineer explained the plans of the extension; and there was no opposition.

Heywood Corporation Gas-Works.—The Gas Committee of the Heywood Corporation are about to make application to the Local Government Board for sanction to borrow £10,000 for the purposes of their undertaking. It is intended to purchase additional land, so that the works may be enlarged when necessary; and it is also in contemplation to extend the plant for dealing with the residual products.

SALES OF STOCKS AND SHARES.

At the Mart, Tokenhouse Yard, E.C., on Monday last week, Mr. Alfred Richards conducted his last sale for the present year of gas and water stocks and shares. It opened with the offer of £3867 of new stock of the Commercial Gas Company, ranking for a standard dividend of 7 per cent., subject to the sliding-scale, though the last dividend on this class of stock was at the rate of 10½ per cent. per annum. The average price realized was £260 19s. 9d. per £100 of stock, which will yield the investor £4 0s. 5d. per cent.; the purchaser taking the dividend from the 1st prox. A parcel of 4½ per cent. perpetual debenture stock of the same Company was next put up, and disposed of at £155 per £100 of stock; yielding £2 18s. 1d. per cent. to the purchaser, who takes the interest accruing from the 31st inst. The total amount realized for the new stock was £10,092 8s.; for the debenture stock, £4429 18s.—together, £14,522 6s. The next lots consisted of £3062 of consolidated stock of the Maidstone Gas Company, the last dividend on which was at the rate of 11 per cent. The average price obtained was £277 1s. 11d. per £100 of stock; yielding the purchaser, who takes the dividend accruing from July 1 last, £3 19s. 4d. per cent. The sale of this stock produced £8484 12s. 5d. Some 5 per cent. debenture stock (practically perpetual) of the North Middlesex Gas Company was sold for £2748 15s., being an average of £140 19s. 3d. per £100; the purchaser, who takes the interest as from the 1st prox., getting a return of £3 11s. per cent. A new issue of fully-paid £10 shares in the Worthing Gas Company was next offered. They were sold at an average of £17 9s. 4d. each, and produced a total of £3091 17s. 6d. The dividend (which will accrue from Jan. 1 next) is at the rate of 7 per cent. per annum; and the yield to the purchaser amounts to £4 0s. 2d. per cent. A parcel of £4250 of 4 per cent. perpetual debenture stock of the Southend Gas Company produced £4895 10s.; being an average of £115 3s. 9d. per £100 of stock, and yielding £3 9s. 6d. per cent. The final lots consisted of £3300 of 4½ per cent. irredeemable debenture stock of the South-West Suburban Water Company, which was sold for £4380, or an average of £132 14s. 7d. per £100; yielding £3 4s. per cent. The total amount realized by the sale was £38,123 0s. 11d.

The following sales of shares have lately taken place: Last Wednesday, Mr. J. Cumberland sold at Derby 50 shares of £100 each in the local Gas Company, the dividend on which is at the rate of 5 per cent. per annum. The shares were disposed of at premiums ranging from £30 to £30 15s. Mr. G. W. Ansell has disposed of six fully-paid £5 ordinary shares in the Cuckfield Gas Company for £7 2s. 6d. each.

ELECTRIC LIGHTING NOTES.

The Local Government Board have given the Ashton-under-Lyne Town Council permission to borrow £34,200 for carrying out an electric lighting scheme.

The Whitehaven Town Council have decided to apply to the Local Government Board for sanction to borrow £7500 for the purposes of extending the electric lighting scheme for the borough.

The Levenshulme District Council have transferred their powers of providing electric light for the district to the Manchester Corporation—reserving to themselves the right to purchase the plant in 21 years.

At a recent meeting of the Gloucester City Council, it was decided to instruct the Engineer to apply to the Local Government Board for sanction to borrow £50,000 for carrying out the work and erecting a dust destructor.

The ratepayers of Buxton, at a public meeting last Thursday, emphatically declared against the District Council undertaking a scheme of electric lighting, notwithstanding that the Council were supported by the presence and opinion of no less an authority than Professor Kennedy. The ratepayers recommended the Council to make the best terms possible with a thoroughly reliable Company. The decision of the Council to construct works was noticed a fortnight since.

Bootle has applied to the Local Government Board for sanction to borrow £35,000 for an electric lighting scheme; and on Friday last Lieut.-Col. A. C. Smith visited the town to inquire into the matter. The Town Clerk (Mr. Farmer) stated that the Provisional Order was obtained in 1895; and in December of that year, the Council issued a circular to 688 occupiers of houses in the borough, principally within the residential area in the centre of the town and the leading business thoroughfares, to ascertain the extent of the patronage an electric lighting scheme would be likely to secure. Only 233 replies were received, of which 150 were in the negative, 32 undecided, and 51 in the affirmative. It was now proposed to put down works capable of supplying current for 8000 lamps of 8-candle power; but the feeder mains would be sufficiently large to provide for 20,000 lamps. The installation, the Town Clerk said, would meet a much felt want; but, unless there has been a considerable change, the above figures do not seem to indicate a very great yearning on the part of the inhabitants for the light. There was no opposition.

A practical step towards the acquisition by the Leeds City Council of the undertaking of the Yorkshire House-to-House Electricity Company was taken last Wednesday, when the Parliamentary Committee decided to recommend the Corporation to purchase the concern. The powers of the Council were explained by the Town Clerk (Mr. J. Harrison); and the City Accountant (Mr. Derry) submitted figures bearing upon the proposed purchase. During the discussion, attention was drawn to the judgment of Mr. Justice North on the previous day in the action brought by the Sheffield Corporation against the Electric Light and Power Company in that city (see "Legal Intelligence"); and it was stated that the position of Leeds in reference to the issuing of irredeemable stock is somewhat similar to that of Sheffield. In view of his Lordship's decision, it is probable that a perpetual stock will be created in Leeds; such a quantity of this stock being transferred by the Corporation to the Yorkshire House-to-House Electricity Company as will ensure to the shareholders a continued annuity of 5 per cent. on their capital outlay. The recommendations to purchase will come before the Council next month.

An important movement is just now being inaugurated among several of the Local Authorities in the Black Country lying between Birmingham and Wolverhampton. In the majority of the towns and boroughs the Corporations or District Councils are in possession of well-equipped gas-works; and they have for a considerable number of years supplied the whole of their respective districts with gas for both lighting and motive power purposes. The shopkeepers and the public generally are now pressing upon the attention of these various Authorities the advisability of making provision for the supply of electricity in addition. Companies are also in course of formation who will apply for Provisional Orders empowering them to supply the new light. The promotion of these Companies has stirred up the Local Authorities who are in possession of gas-works; and the whole of them have already decided to make application for Orders conferring upon them the right to supply electricity in the areas over which their right to supply gas at present extends. The West Bromwich Town Council and the Oldbury and Smethwick District Councils have all decided to take steps to acquire control of the electric lighting in their respective places. The West Bromwich Corporation have adopted a limited scheme which will involve an expenditure of close upon £20,000. It will cover an area embracing the principal thoroughfares in the borough; it being intended to enlarge the area in future as occasion may require. In some places, the shopkeepers are pressing these governing bodies to supply them with electric light.

The St. Pancras Vestry, at their meeting last Wednesday, discussed electric lighting matters for some hours. The important question of lightening the cost of supply to consumers using current for long hours each day was first considered; and a proposal was made by the Electric Lighting Committee to offer such consumers the option of being charged on the basis of their maximum demand—"a system corresponding to that adopted by the Brighton Corporation, whereby most consumers would benefit by some reduction, and those who are specially profitable to the undertaking, in consequence of the long hours they use the current, would by this measure obtain substantial relief." The rates would be: 6d. per unit for the first three hours each day, and 3d. per unit thereafter; while a small rental would be charged for the indicator. Dr. Smith could not see that the fact of reducing the price would benefit the Vestry; and he moved an amendment to the effect that the scheme should be sent back, and a further one prepared if possible, which, "while protecting the interests of long-hour consumers, would at the same time be applicable to the other consumers." Mr. Close, while supporting the original proposal, candidly admitted that, though the undertaking had been established for six years, "it practically showed a loss instead of a profit;" and he thought the reduction would attract more consumers, many of whom had to give up using current on account of the cost. After a long debate, Dr. Smith's amendment was lost; and the Committee's recommendation was then carried by a large majority. Another important matter that came up for decision was the proposed extension of the system to Highgate. The Engineer estimated the cost at £1630 for public lighting, and £7765 for private lighting; and he pointed out that "the 175 gas-lamps will be supplanted by the arc, and the illuminating power will be greatly increased, as each lamp will be about 500-candle power." Furthermore, he added: "The cost of arc lighting per annum would compare with gas as follows: 175 gas-lamps at (say) £3 per annum, £525; lighting by arcs, at 5d. per unit, £986. The figures show an increase over gas; but it should be borne in mind that there will be a profit accruing to the Department instead of to the Gas Company, and there will be an increased illumination far in excess of the proportionate increase of cost." This official very truly remarks that "the cost of providing private lighting is considerable, in proportion to the probable immediate revenue; and unless we are able to assist this revenue, there will be a deficit for a long time in connection with the private lighting in the district." In the discussion that followed, Mr. Hunt declared that he personally had found the electric light so poor that he had to use candles in addition. Mr. Prosser moved the postponement of the scheme "until such time as the demand for supply may reasonably be expected to prove remunerative;" but the amendment was lost. So, too, were other amendments; the Vestry in the end practically sanctioning the proposed scheme in its entirety.

Last Wednesday, Mr. C. P. Cotton held, in Dublin, an inquiry, on behalf of the Local Government Board for Ireland, with regard to an application made by the Corporation for authority to borrow £20,000 for the renewal of the cables used for the electric lighting of the city. Mr. Macinerney, Q.C., who appeared in support of the application, sketched the history of the electricity undertaking, and said that everything went on very well until last year, when several breakdowns in the cables occurred, which were attributed, by those who were skilled in the matter, to the wearing out of the rubber insulation. In reply to a request for an additional loan, the Local Government Board said they could not sanction one for the renewal or replacing of works executed under former loans which were still current, and that they could only grant a fresh loan for works that were altogether new. The total amount spent on the existing cables was £3300; and they would be available to the extent of about £2000. No portion of the loan now sought would be expended on anything but what was new; and taking into account the loans already granted which had not all been taken up, and also the proposed loan, there would still be borrowing power to the extent of £31,000. The City Electrical Engineer (Mr. Mark Ruddle), the Town Clerk, and the City Accountant gave evidence in support of the application. Mr. Ruddle stated that the proposed loan was for the execution of new works. The system, in order to keep up with modern requirements, and work more economically, must be changed. It was the opinion of their Consulting Engineer (Professor A. B. W. Kennedy) and himself that the change would be for the benefit of the citizens, and would cause a considerable saving in working expenses. To keep up the present supply and effect improvements, they proposed—instead of putting in new cables, which would be used in the extended area which they contemplated supplying—to use them first to continue the supply to present consumers, and also to improve the system as a kind of duplicate for a time. For engineering reasons, they were bound to keep up the supply and use the new cables. When they had the new cables there would be no necessity for continuing the old system, and they would relay it in a different way. The real loss on the old cables would be £1300. They would effect a saving in the generating expenses of the old system, and would put down low-tension distributing mains in addition to the existing ones, and so give a better service to customers. They proposed to extend the supply as the demand grew. Any repairs

to the old cables would be done out of revenue. After the proposed loan, the Corporation would still have a borrowing margin of £31,712. The total of the electric lighting loans sanctioned was £64,000, of which £58,000 had been expended. The annual profit was put at £2025; and of the loans £10,330 had been repaid, while in 1891 and 1892 a sum of £6000 had been taken from the rates. Mr. Gordon, Q.C., who appeared for some ratepayers, disclaimed any hostile attitude in regard to the application. He was there simply to safeguard his clients' interests. The total borrowing power of the Corporation was about £1,400,000; and it now appeared that they were within £31,000 of the end of these powers. This was perilously near. When the Corporation found they could not get this loan for renewals, they adopted an entire change of front. No depreciation fund had been formed. The new loan was wanted practically to cover loss occasioned by depreciation. They proposed to lay down new and powerful cables; but they would not then have adequate means of supplying them with electricity. The allegation that the old cables could be utilized to any valuable extent was idle and absurd. Mr. Ruddle had spoken of new work; but what the loan was really wanted for was renewals. Mr. Cotton remarked that the witness had spoken of what would be a change in the method of distributing the electricity, which was not at all a matter of renewal. Mr. Gordon said if they were to have electric lighting, it should be on an adequate and efficient system. His clients did not believe that the Corporation were the best body to secure that; and if a company could do it better, it would be the duty of the Corporation not to stand in the way. Mr. Macinerney having replied, the inquiry closed.

Kidderminster Town Council and the Gas-Works.—The Committee appointed by the Kidderminster Town Council to inquire into the question of purchasing the gas-works, reported last Wednesday that they had made an offer to the Gas Company to pay them 25 years' purchase of the maximum dividends for the undertaking; but this had been absolutely declined by the Directors. In the opinion of the Committee, the Company would before long have to promote a Bill in Parliament for the purpose of increasing their capital and powers; and therefore they recommended the Council to defer further action till then. The Chairman of the Committee (Mr. Ray), in moving the adoption of the report, alluded to the quality of the gas, and said that, considering the Corporation paid the Company nearly £2000 a year for gas, it ought to be of better quality. Alderman Bucknall remarked that, if the rumour was true that the gas-works required £16,000 spent upon them, the Corporation were well out of the matter. The report was adopted.

The Proposed Gas Loan of the Vienna Municipality.—A correspondent of the "Financial News" writes as follows on the above matter: "The announcement that the Vienna Municipal Council intended to open negotiations with banks for the gas loan has rapidly been followed by action. Dr. Lueger, in contradiction of his former policy, has opened negotiations, and has not only sent direct invitations to foreign banks, but also to a number of Vienna houses. The wording of these invitations was not identical. Whereas some inland and foreign banks were only asked to send a representative, without stating the subject to be discussed, others were made acquainted with the fact that a city loan of 60 million crowns, under certain conditions, was to be issued. Of Vienna banks, the Niederösterreichische Escompte Gesellschaft, the Länderbank, and the Union Bank were asked to attend the meeting. Of the foreign banks, such as have become known, are the Deutsche Bank of Berlin and a Syndicate of Belgian financiers in Brussels. The invitations were discussed with great animation in Vienna financial circles, and the greatest astonishment is expressed. No one supposed that, after the many insults he has levelled at Vienna financial groups, Dr. Lueger would have appealed to them for a loan. The Vienna banks, it is true, would perhaps feel inclined to refuse any dealings with the Burgomaster who has treated them so shabbily; on the other hand, they are compelled by their shareholders to transact new business. It is stated that the reason why the Vienna banks were approached was a fear lest the negotiations with the Deutsche Bank should be fruitless, although the City Fathers would very much desire to interest foreign capital in their enterprise. The Escompte Gesellschaft is perhaps the only bank which evinces any lively interest in the gas loan; but even the Berlin financiers associated with the latter bank do not share this sympathy."

The City of London and the Water Question.—As mentioned in the "JOURNAL" last week, the County Purposes Committee of the Corporation of London have prepared a report upon the question of the London Water Supply and the Royal Commission appointed to inquire into it. The Committee, after pointing out that the citizens and ratepayers of the City living outside its boundaries have interests identical with the rest of the water consumers, remark that, under the special conditions of the City, the financial bearings of the question assume exceptional importance. It is obvious, the report says, that as the City pays one-eighth of the rates of the whole Metropolis, it will have to find one-eighth of the purchase-money and pay one-eighth of the increase, if any, in the water charges. It is pointed out that seven years ago the value of the eight water undertakings was stated to be £33,440,000; while evidence had been given to the effect that the purchase of these undertakings at £30,000,000 would have the effect of increasing the present water-rate at least 30 per cent. The Committee declare that the Water Companies should not in the future be conducted merely as commercial undertakings, but should be carried on primarily in the interests of the consumers. It did not necessarily follow that because the purchase of all the undertakings would, or might, involve such an increase of charges as had been indicated, that the purchase of one of them by a particular authority might not be advantageous. One of the most important questions the Royal Commission will have to deal with will be the future operation of the Chamberlain's sinking-fund clause and the appropriation of moneys thereby accumulated, according to whether purchase or control is eventually decided upon. From the notices the Chamberlain has already received, it appears that the Companies have already raised, or are raising, £2,210,000 subject to the operation of this clause; the whole amount to which it will eventually apply being £6,320,030 of debenture stock. The report states that it is probable the London County Council will make a proposition to the Royal Commission on the subject, the nature of which the Committee have not yet been able to ascertain.

THE METROPOLITAN WATER SUPPLY COMMISSION.

Second Day—Monday, Dec. 6.

(*Before Viscount* LLANDAFF, *Chairman*, *Sir* J. E. DORINGTON, Bart., M.P., *Sir* G. B. BRUCE, M.Inst.C.E., *Major-General* A. DE COURCY SCOTT, R.E., *the Right Hon.* J. W. MELLOR, Q.C., M.P., *Mr.* A. DE BOCK PORTER, C.B., *Mr.* H. W. CRIPPS, Q.C., and *Mr.* R. LEWIS.)

The Commissioners sat, as on the occasion of their first meeting (see *ante*, p. 1186) in the Moses Room of the House of Lords.

The following are the Counsel engaged: Mr. POPE, Q.C., and Mr. CLAUDE BAGGALLAY, Q.C., for the New River and Southwark and Vauxhall Water Companies; Mr. LITTLER, Q.C., and Mr. LEWIS COWARD for the Kent Water Company; Mr. PEMBER, Q.C., for the Lambeth, East London, Grand Junction, and West Middlesex Water Companies; Mr. RICKARDS for the Chelsea Water Company; Lord R. CECIL for the Hertfordshire County Council; Mr. BALFOUR BROWNE, Q.C., and Mr. FREEMAN, Q.C., for the London County Council; Sir R. NICHOLSON for the Middlesex County Council; and Mr. GABRIEL GOLDNEY (Remembrancer) for the Corporation of the City of London.

On the resumption of the inquiry,

The CHAIRMAN said: Before we proceed with the evidence, I think it would be convenient that I should indicate the course the Commission intend to follow. We have decided not to reopen the questions reported upon by the Royal Commission presided over by Lord Balfour; and, speaking generally, we accept the findings of that Commission.

Mr. *H. L. Cripps*, the Parliamentary Agent to the London County Council, in further reply to the CHAIRMAN, referred to the question put in the earlier part of his examination, as to whether a report had not been made to the London County Council in which it was stated that the purchase of the Metropolitan water undertakings at £30,000,000 would have the effect of increasing the present rates by at least 30 per cent. Witness had not been able to find any report in which this was stated; and he disclaimed all responsibility for it. Regarding the question of overlapping, touched on at the first sitting, he said what he had endeavoured to point out was that the position of the London consumer was intended to be secured by legislation in preference to competition. In order to make this clearer, he handed in an exhaustive table, showing the various areas in London under the Metropolis Management Acts, the Companies originally authorized to supply water within the area, and the manner in which Parliament had introduced and confirmed the principle of competitive powers of supply in London. Thus the first place in the list—Battersea (St. Mary)—was being supplied in 1800 by the Lambeth Company, under an Act of 1784; but the West Middlesex Company in 1806, and the Southwark Company in 1834, were also empowered to supply there in competition. In 1848, powers were again given to the Lambeth Company in regard to the district; and in 1852, Parliament confirmed the powers already granted to the West Middlesex and the Southwark and Vauxhall Companies for competition with the Lambeth Company in this area.

The CHAIRMAN: Did the West Middlesex and the Southwark and Vauxhall Companies introduce a new and competitive supply into that parish?

Witness: The West Middlesex Company never has; the Southwark Company, I believe, did.

Do you mean by a competitive supply that the two Companies were supplying the same street at the same time with two different sets of mains?—They certainly were in some parts of London. Whether it was so in the parish of St. Mary, Battersea, I cannot tell you; but there are several parishes in the South of London where the Lambeth Company were originally supplying and the Southwark Company were introduced and acted as competitors subsequently.

That is, there were two sets of mains in one street, each offering supplies of water to the same houses?—Yes.

Does that state of things still exist?—To a certain extent; but nearly everywhere the Companies, by combination among themselves of an extra-parliamentary character, and, as I venture to suggest, in contravention of the understanding on which they obtained their Acts, have agreed not to interfere with one another. In certain parts of London, however, where for some reason or other they could not carry out the arrangement, the competition still exists, to the great advantage of the consumer.

Is there not power in all these Acts for a certain number of consumers to call upon the Company to supply them?—In two of the Acts there is; but in the other Acts of 1852, a proviso was introduced which has had the effect of preventing a consumer from compelling one Company to bring their mains into the district in which he resides if the district is at the time actually supplied by another Company.

Mr. PEMBER remarked that the proviso was in section 60 of the East London Company's Act of 1853.

Witness (continuing) said this proviso applied to six out of the eight Companies. It did not apply to the Lambeth Company, nor to the Kent Company.

The CHAIRMAN: Does it apply to the West Middlesex and Southwark and Vauxhall Companies?

Witness: Yes.

Then the case of competition which you have given us is one where competition was expressly dispensed with, because the Lambeth Company were already supplying, and powers are given to the West Middlesex and Southwark and Vauxhall Companies with the proviso that nobody shall enforce those powers. That proviso was not inserted in the Act of 1806 with regard to the West Middlesex and Southwark Companies.

Mr. PEMBER: It was in 1852.

Witness (continuing) said he did not mean to suggest that the West Middlesex and the Lambeth Companies were competing between 1806 and 1852. The former had never exercised their powers south of the Thames. In all these Acts, the demand for a supply from a Company was based upon the condition that a sufficient number of householders should request the supply to make up one-tenth of the capital necessary in order to lay down the distributing pipes. In 1847 this was made part of the Water-Works Clauses Act. He did not think there was power in the Act of 1806 for any ratepayer to call upon the West Middlesex Company to supply him with water; but authority was given to the Company to supply in the district. Witness went on to refer to the case of St. Marylebone, in which the Chelsea Company were authorized to supply

by an Act of 1721. In 1810, the West Middlesex Company, and in 1811 the Grand Junction Company were empowered to supply there. The New River Company also furnished water there; but their statutory powers were a little doubtful. He supposed they depended on Charter.

Mr. BIRCHAM, representing the Southwark and Vauxhall Company, in the absence of Counsel, said the Company had never been in active competition with the Lambeth Company in the district just referred to. The two Companies entered the parish at different ends; and when they met they stopped.

Witness went on to state that Marylebone was one of the areas which was supplied in the early part of the century by the New River and Chelsea Companies. He admitted that in the Chelsea Company's Act of 1721, Marylebone was not specifically mentioned; but he pointed out that the Company, in addition to the areas named, were given power as to "divers other places in the county of Middlesex." In the Act of 1806, they were specifically given power of supply in Marylebone. As showing that Parliament intended the West Middlesex Company to compete directly with the existing undertakings in Marylebone, witness referred to a circular sent out by the West Middlesex Company, in which they sought support for their Bill, on the promise of providing purer water and at a higher pressure.

The CHAIRMAN: Is there an indication of the intention of Parliament to allow competition? Is there a recital anywhere in an Act of Parliament that, in view of there being a bad supply, and of the Company charging too much, the inhabitants ought to have a better supply?

Witness: I do not recollect at the moment that there is. Continuing, he stated that there was a time when the Chelsea and New River Companies were supplying Marylebone, when there was such great discontent among the people that they endeavoured to get a competitive service; and they obtained it in 1806, to a certain extent. From the consumers' point of view, it was so beneficial that they agitated for a further extension; and in 1810, Parliament granted more powers of competition. The net result was that the older Companies, who were said to be delivering bad water and at high prices, were driven out, and another Company, supplying better water, and certainly at lower rates, came in and took their place. Mr. Cripps read *in extenso* a petition which the vestrymen of Marylebone presented to Parliament in 1818 in reference to their water supply. In this it was set forth that the district was served by four Companies—the New River, Chelsea, West Middlesex, and Grand Junction—and that since the competition had existed the water had been abundant and the rates reduced. The vestrymen had learned that two of the Companies had agreed to retire, and that the other two had undertaken not to interfere with each other. They therefore prayed for relief in one of a number of ways which they suggested—the object being to secure the maintenance of the competition; or they asked that they should themselves be given power to supply. There was a great deal of agitation at that time on the water question, and it culminated in the appointment of the Committee of 1821. One paragraph of this Committee's report stated that the principle of the Acts under which the East London, West Middlesex, and Grand Junction Water Companies were instituted was to encourage competition; and certainly in these, the report proceeded, as in other cases, it was only by competition, or expectation of it, that perfect security could be obtained for a good supply.

The CHAIRMAN remarked that the Committee went on to say the experiment of competition had failed.

Witness said the Committee saw that the principle of competition ought to be guarded by particular checks, in order to prevent it being a serious injury to the public, for they perceived the force of what the vestrymen of Marylebone objected to, and were afraid that if the Companies were left alone, the weaker ones would be destroyed, there would be a great monopoly, and the people would be worse off than ever. He held that the recommendations of this Committee were fully before that of 1852, and were entirely confirmed; for the later Committee, in the batch of Bills before them, continued the competition in the areas existing in 1821. Between that and 1852, the Water-Works Clauses Act had been passed; and it was incorporated in the Acts of 1852. It was pointed out to the Committee of that year, that, unless some alteration were made in the Act, much larger power would be given to consumers in London than they had before, and that this power might be exercised very hardly to the Water Companies. The result was that in the case of six of the Companies a proviso was inserted under which the power for consumers to call on the Companies to supply should not apply in their cases as against other Companies actually at the time serving the particular district.

The CHAIRMAN asked for the exact words of the proviso.

Mr. PEMBER: Here is the East London Act of 1853, which is a good sample of the others. Section 60 says: "Provided always that the Company shall not be bound to furnish any such supply of water, or lay down any pipe for such purpose, in any part of the district which part is for the time being supplied with water by any other Company."

The CHAIRMAN: That strikes me as expressly excluding competition.

Witness: Then it would be entirely inconsistent with the whole scope of the Act.

Can you mention any case since 1847 in which Parliament has created a fresh supply in competition with an existing supply?—No; I do not think I can.

Can you mention any case in London in which, in fact, at the same time there are two Water Companies with mains in the same street supplying, or able to supply, the same houses?—At the present moment, quite apart from the period we have been dealing with, there are places in which different Companies have mains in the same streets, and are able to supply. I would rather, however, that you got the details from the Engineer to the Council.

Witness went on to state that, as he suggested, a distinct pledge was given to Parliament by the Companies in 1852, on the faith of which they got the Government Bill of that year rejected and obtained the powers to charge that were contained in their own Bills. This pledge had not been fulfilled. There was a Committee on the Government Bill and the Companies Bills of that session. On behalf of the Companies, the Committee were told that it was absolutely impossible to fix an unbending scale of rates; they must give a maximum rate, which could be varied and modified according to the circumstances of the locality and the description of consumers. It was on this understanding the Bills were passed.

Mr. LITTLER quoted the Chairman of the Committee when announcing their decision on the Bills, from which it appeared that the Committee were clearly of opinion that the maximum rates would have to be charged.

Witness, in further reply to the CHAIRMAN, stated that the scales of charges proposed by the Companies were to some extent modified in the Bills as passed. The Government Bill of 1851 was brought in with the object of forcing the Companies to come into a sort of combination, to fix the amount of money to be paid to each, and to fix the rates. The first process under the Bill would have been to dissolve the Companies and merge them all together, giving to each a share in a capital stock representing the value of the undertaking; and it was provided that the dividend should not exceed 5 per cent. unless reductions in the rates of charge to the consumer were made, when the dividend was not to exceed 6 per cent.

Mr. LITTLER said these dividends were to be on capital ascertained by valuing the Companies under the Lands Clauses Act; so that the stock might be two or three times the actual value of the concerns.

The CHAIRMAN: Was that resisted by any of the Companies on the ground that it was a breach of parliamentary faith?

Mr. PEMBER: It was fought for a whole session.

The CHAIRMAN: But on that ground I mean?

Mr. POPE: At that time, there were no scheduled rates contemplated. Rates came into existence by the Acts of 1852. Before then there was no limit to the charge, though actual rates were before Parliament.

Mr. BALFOUR BROWNE said in certain cases rates had been fixed. In 1826, 1829, and 1834, in the case of five Companies there were rates fixed. The other Companies had powers to charge by agreement.

Witness, with reference to the rates of charge of the Companies for domestic supplies, said these were fixed from 1826 to 1834; and in 1852 they were reduced. The Lambeth Company was the only one now allowed to charge on the old scale. He explained that, in consequence of the cholera outbreak, the Lambeth Company went up the river in 1848 to procure a fresh and purer supply; and they did not therefore come to Parliament in 1852. In this way they escaped the revision which then took place. The Company had since come to Parliament on a number of occasions; but witness could not say why they had not been treated as the other Companies were in 1852. The Government also had a Bill before Parliament in 1852, which was ultimately passed into law as the Metropolis Management Act of 1852. Parliament appeared to have thought that the potentiality of competition rendered it unnecessary to enforce special rates.

The CHAIRMAN: We know you advocate purchase by the London County Council. Will you lay before the Committee what you consider the advantages of purchase?

Witness: I am afraid I am not here to advocate any particular proposition on behalf of the London County Council, or of anybody. Personally, I think purchase is the only way in which this question can be finally settled.

I am asking you, as the representative of the County Council, what advantages from the transfer of the Companies to one Authority you conceive we ought to take into consideration?—I think the most important advantage of all is that by purchase you will effect a final settlement of this question, which, so far as I can see, you can effect in no other way. You will secure the same advantages that other municipal bodies have secured for themselves. You will obtain direct means of communication between the people and those who are responsible for the supply, because the people will at all times be able to communicate through their representatives, and bring pressure to bear upon the elected local body which has the administration of the water-works. It is rather different now. Even as regards facility of communication, I think there would be great advantage in dealing with the whole of London as an area, and establishing offices in particular districts so that the officials could be more conveniently accessible to the people.

This would mean that more offices would be started than exist at present?—It might be so; at any rate, they would be more conveniently placed. I think the East London Company's office is in the City, which is very inconvenient for the consumers. Of course, the object of the Local Authority in administering the water supply would be to arrange offices and systems of administration with the sole view of the convenience of the people. I do not mean to say the Water Companies do not consider the convenience of the people—I think they do very much. But the prime object of a Water Company must be the earning of dividends. Then another most important result will be an equalization all over London of the rates of charge. If the purchase takes place, I think there can be no doubt that ultimately there will be a reduction of the water-rates all over London. Anyhow, you will get rid of a peculiar and unfair anomaly, under which people who happen to live in one district pay much less for water than those in another.

You base this observation upon the different charges of different Companies?—Yes. Then I think the Local Authority is responsible for the general administration of health. From the medical officers, not only of London but of all the different districts of London, and the analysts advising those medical officers, you will find inconsistent and varying reports framed strongly against the water; while the official authorities maintain that the water is all that can be desired. This is an unsatisfactory state of things; and I do not see how it can be remedied other than by the Local Authority having, as in all other cases, the management and ownership of its own water-works. I have never seen the general arguments in favour of purchase more clearly stated than they were by Mr. Chamberlain in his Birmingham Bill.

I understand the County Council advocate the purchase by one Authority—viz., themselves?—Yes; they introduced their Bill in 1895 and 1897 for that purpose.

They have felt all through that concession must be made to the views of the Local Authorities included in the water area of London?—Yes.

Have the Surrey, Hertfordshire, Middlesex, Kent, and Essex County Councils insisted upon their rights as against the London County Council?—Speaking generally, I should say they have. There is, however, a distinction to be drawn between the cases.

I understand you have come to some sort of agreement with them?—With some of them. The authorities concerned were the counties of Surrey, Middlesex, Essex, and Kent, the county boroughs of West Ham and Croydon, and the boroughs of Kingston-on-Thames and Richmond. Subject to confirmation by Parliament, an arrangement was arrived at under which the Surrey County Council have agreed to hand over to the London County Council not only the works of distribution of the

Lambeth Company within the county of Surrey, but a portion of the works of supply and of the powers of taking water from the Thames. The price, failing agreement, was to be fixed by arbitration. It was in consideration of this agreement that the Surrey County Council were prepared to assent to the Bill of the London County Council then pending in Parliament. The case of Croydon was rather peculiar, because besides the Croydon Corporation the Lambeth Company also had power of supply within part of the borough. The Corporation considered that they had a sufficient supply from their own sources; and therefore all they wanted was liberty to supply themselves without reference to the Lambeth Company. The arrangement with them, therefore, was of a different character. They were to have no part of the water which the Lambeth Company were empowered to draw; but they took the mains and pipes and means of distribution, and powers to charge within their own area. Shortly, the difference between this case and that of Surrey was that, whereas Surrey wanted a portion of the water that was being bought, the Croydon Corporation did not. With regard to Kent, the Local Authorities in the neighbourhood of London, by mutual consent, arranged to act together independently of the Kent County Council. In substance, the agreement with the Kent Authorities was the same as with Surrey.

Are you aware the last decision of the counties of Kent and Surrey is that purchase is not desirable under all the circumstances?—No.

I am speaking of a conference that was held on Oct. 25 of this year, when the representatives of Kent and Surrey, as I am informed, were of opinion that, having regard to the circumstances, it was not desirable to purchase. You are not aware of that?—No.

Witness (continuing) said the next county was Essex; and here, too, no absolute decision was arrived at, though there was a substantial agreement as to what course should be taken. Essex, like Kent, he imagined, regarded the whole thing as being conditional on the purchase by the London County Council being authorized. If there was to be a purchase at all, they would prefer to buy their own portion, and not that the supply in Essex should be administered by another body. He believed the Council considered the negotiations with Essex equivalent to an agreement that, if the Bill for the purchase of the East London Company had gone forward, a clause for Essex similar to that for Surrey was to be inserted; as Essex, like the other two counties, wanted to have the management of their own water, both as regarded supply and distribution. Hertford, the London County Council were obliged to leave alone, because very little of the county was supplied by the Water Companies. A great part of the water furnished to London, was, however, derived from Hertford. Hertford did not want to lose their own water; and they were afraid that under any new arrangements there might be larger drafts upon it than if the New River Company remained in existence.

The Chairman: And further than that, is not Hertfordshire afraid that it might be embarked, jointly with the rest of the Metropolitan area, in some expensive scheme of bringing water from a distance, when they have plenty in their own county?

Witness: I can hardly say that. There was a suggestion made that they should be left alone, and have their own water. They were asked what they would take for it; but the negotiations did not get much beyond that. With Middlesex, the London County Council were quite unable to agree. The position of Middlesex in relation to London differs considerably from that of the other counties. Middlesex profits by the present state of things, at the expense of London; and, not unnaturally, they wish to retain this position.

Does Middlesex also desire to have control of its own water supply?—I cannot tell you.

Mr. Littler: They wish to be left alone.

The Chairman: All these questions lead up to this: You have been driven, so to speak, into agreements with all the various counties and authorities round London, by which the water undertakings, if purchased, are to be split up between them?

Witness: Yes.

You will therefore be substituting six new water authorities for the eight existing Companies?—Croydon is already a water supplying Authority.

That is so. I will content myself with the five. Is that the result of all you have been doing hitherto? If you were to buy them all, you would be driven to split up the Metropolitan area into five?—Not the Metropolitan area.

The Metropolitan water area?—Yes; that is so.

Would you not therefore be sacrificing all the advantages of concentration you put forward?—I think not.

You think a division by five is wholesome, but division by eight is intolerable?—The condition which would be established is one which is proved by experiment and experience to be satisfactory in other cases; and it is one which is imposed by Parliament in all cases of purchase.

Still you say it does not sacrifice the advantages of concentration?—I do not see that it does.

Not if the sources of supply are split up between five counties?—Not if the whole thing is adjusted upon fair and proper principles.

Yes; but there is no concentration left. It may be fairly and perfectly justly done; but concentration is gone. You must have different staffs, different engineers, different secretaries. All the advantages of concentration are sacrificed, are they not?—Not necessarily, that I can see. The local bodies have their own officers, of course. In the first instance, no doubt, the existing Companies' staffs would be largely made use of.

Very well. Do you know of any cases in which a Water Trust has been established by Parliament covering the area of several local authorities—and compulsorily established?—I am very familiar with one.

Is there not a Water Commission or Trust that covers Edinburgh, Portobello, and Leith?—Yes. I know there was a Bill introduced into Parliament to extinguish dual authority; but I do not think it passed.

The Bill passed which created this Authority?—Then I think a Bill was introduced to put an end to it—it was found so unsatisfactory.

Is not Dundee and the surrounding authorities a case in which there is a Water Trust—a single board, not being one of the ordinary local authorities—which manages the water supply for the communities?—I am not acquainted with the exact circumstances.

Do you know Belfast and the neighbouring authorities?—Yes; very well.

Is that a case in which Belfast and the surrounding local authorities all have their water supply managed by a single Water Trust?—Yes. Before Belfast was made a borough—before the Corporation came into existence—the Water Trust was created; and it was continued.

It was a representative board?—Yes; I believe it is the only case in the United Kingdom of that class. It is a representative body elected on a different basis to the Corporation; and it acts independently of the Corporation. That does not work satisfactorily. To begin with, whenever the Corporation introduce a Bill into Parliament in any way dealing with the town, it is opposed by the Belfast Water Commissioners, who have their own interests to protect in their mains, &c.; and, in the same way, whenever the Water Commission promote a Bill, it is opposed by the Corporation.

Do I understand you that these objections, made by the Water Trust on the one hand, and by the Corporation on the other, to each other's proceedings are frivolous and ill-founded?—No; I think each body is perfectly entitled to protect its own interests. I do not see any harm in it, except the question of expense and unnecessary difficulty. If you have the water supply and the main sewers of the town under the management of one engineer, there is no question or controversy about it. But if you have the main sewers under the engineer of one body and the water supply under that of another, you will get constant trouble.

I suppose you cannot pretend to say what the feeling of the Local Authorities about London would be regarding a Central Water Board or Trust?—I took a great deal of trouble to ascertain that in 1891. I gave evidence upon it to Sir M. W. Ridley's Committee; and I had to consider it all over again in reference to the Bill introduced by the Government in 1896.

Do you think the Local Authorities and the counties around London would object as much to a Water Board or Trust as they do to the London County Council?—I think so.

Lord R. Cecil: As far as Hertfordshire are concerned, though we should not, perhaps, have the same objection, still we should object to it. What we desire is control.

The Chairman (to witness): Your objection to a Water Board is that it introduces possible friction?

Witness: I do not know that I object to it; but in the case of the County Council, it would have been impracticable.

Why?—Because all the arguments which justify the London County Council in urging that a transfer of these undertakings to themselves should be made, even with more force justify the Local Authorities round London in saying that a transfer to them of their portions of the undertakings should be made. I think that what all the Local Authorities desire is to have the control of their water supplies.

Lord R. Cecil: That is not what we want. We wish to have it controlled by a separate body.

Witness (continuing) said the whole administration of water was so very relevant to sanitary considerations, that very properly, as it seemed to him, the local authorities responsible for the health of their districts desired, and ought to have, control of their own water supply. Several of the authorities, he knew, would rather remain as they were than have any interference.

The Chairman: Except local feeling, is there any argument against the central representative Board?

Witness: I think there are a great many arguments. It is admitted on all hands that if you have a Central Board, London must be the predominant partner. We are concerned in this matter to the extent of four-fifths, and the outside area to the extent of one-fifth. Therefore we must be the predominant partner in such a Board; and Hertfordshire, Middlesex, and all the other counties will not agree to this. If you are to have the outside area made the predominant partner, you will give one-fifth the right to control four-fifths. This is the difficulty you have to face at the outset.

The moral of all that is, is it not, that concentration in any form becomes impossible—nobody will tolerate concentration in the hands of the London County Council or of a representative Water Board? You must therefore have division between several counties?—I think that is what it comes to.

The Commission then adjourned till yesterday (Monday).

GRAND JUNCTION WATER-WORKS COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held at the Offices, South Molton Street, last Wednesday, under the presidency of Mr. Frederick Tendron.

The Secretary (Mr. J. Goodwin) having read the notice convening the meeting,

The Chairman stated that the figures for the year to Sept. 30 last compared favourably with those of the preceding year. On the ordinary receipts and expenditure of the year, there was an increased profit of £5500; and apart from special expenditure, dealing with the general receipts and outgoings, there was a surplus over the interest and dividends of no less than £12,495. Apart, therefore, from the reserves they had to make, they were earning within a fraction of 9 per cent. The first was the large outlay they were still incurring for lowering the mains. They had lowered about 60 miles; and there were 20 miles still to be done, which meant a further expense of £8000 or £9000. They undertook this because they felt that it was their duty to guard their districts against such terrible consequences as those which befell them during the unprecedented frost of 1895. When they had lowered their mains, they would have done all they could for the protection of their consumers. He wished that the latter would exert themselves a little more, and bear the small expense necessary to put their communicating pipes in better condition. They had urged on the authorities to impress on the public to do what devolved on them for their own protection. The excess he had mentioned of about £12,000—which, according to their past experience, would go on increasing year by year—was ample to meet the charges which were incidental to the carrying out of the Staines Reservoirs Scheme. The interest they would have to pay on the money raised would increase year by year. The works would probably be in hand 4½ or 5 years; and until they were completed, the proportion of charge which they had to bear consisted simply of interest on the capital and their share of the management. The capital would only be raised as required, and would never involve a higher charge, as far as their experience went, than about £12,000 a year (to which amount it would gradually increase), until the sinking-fund clause came into operation.

This would only be the first half year after the water had been let into the reservoirs. Therefore they had five years in which to put by money to enable them to meet the charges that would fall upon them for the sinking fund, and their proportion of the pumping and other charges, rates and taxes, water supply and maintenance, and everything else in connection with the scheme. Roughly speaking, he thought they might reckon the total charges in connection with the scheme at about £25,000 a year. Taking their ordinary increase of profit, they ought to be in a position to face this comfortably when the crucial time came. Once they had passed over a couple of years of this trying time, they would begin—if the expectations of the representatives of the London County Council were anything like fulfilled as to the increase of population in Greater London—to be paid for the additional water they would be supplying through the Staines reservoirs; and every million gallons per day would represent a very fair amount of profit. If they were only let alone, and allowed to continue their efforts for the good of the public and the shareholders, he saw no reason why, a couple of years after the Staines reservoirs were in operation, they should not be on the road to their maximum dividend. The increased dividend over 7½ per cent. applied to a very small capital for a large Water Company. The whole of their 10 per cent. capital only amounted to £846,000; the rest being 7½ per cent. shares and debenture stock. They had raised in the last eighteen years nearly £105,000, at an annual cost in interest and dividend of £3400; and they were now bearing the whole of this cost. He did not know that the entire works would be completed for this sum; but at all events it could not be a large amount that would be required to finish them. The chief works were the duplicating of mains, as a safeguard against accident, raising the engine power, and largely increasing the filtration area—all most important. The works, however, would not bring in money; but neither would they cost them more, for they were already bearing the £3400 a year. They therefore knew the worst; but the outlay incurred ensured a full supply to their district in time of drought, and went far to secure the almost absolute purity of the supply. Knowing how ready the shareholders had always been to endorse the policy of the Board to serve them by serving the public, and that they had never grudged the raising of money when it had been necessary, it was rather hard that a gentleman who ought to know something of the subject he spoke of—for he was Chairman of the Water Committee of the London County Council, and also a member of the Thames Conservancy Board—should deliberately state that London was, in his mind, upon a volcano, and that what had happened at Maidstone was as nothing to what would take place in London. How little such a statement was justified, was not only shown by the monthly analyses of the water taken daily by the eminent chemists, Sir W. Crookes and Professor Dewar, but also by Dr. Frankland, who reported to the Government Water Examiner. He had taken the last report that was published; and without going into minute details, he would compare the water of the Grand Junction Company—and the supplies of the other London Companies were just as good as theirs—with that of the Corporation of Birmingham and that from Loch Katrine supplied to Glasgow. There was an infinitesimal difference in the carbon, the combined nitrogen, the ammonia (there was no ammonia in any of these waters), and the chlorine. The points for analysis were absolutely similar. The only variation was in the suspended matter; but when he told them that they would have to go on drinking water at the rate of 1000 tumblers a year for five years before they succeeded in getting one grain of suspended matter into their system—if it were possible to go on accumulating the whole time—he thought they could face the prospect with great cheerfulness. It was true that it would take ten times as long to get one grain of suspended matter out of the Loch Katrine water; but they would have other disadvantages to counterbalance that. He now came to a very important point—that was, the microbe and the pathogerm. The microbe was perfectly harmless; it existed everywhere. It might be nutritious, for aught they knew to the contrary. The pathogerm was deadly. The pathogerm that was feared was the typhoid bacillus. But on this subject they had to bear two things in mind—namely, that the pathogerm was larger than the microbe, and that the latter was the enemy of the pathogerm, and killed it wherever it could. Mr. Groves, the Chemist of the Thames Conservancy, had said on the subject of the River Thames: "The cause of the difference between the effect of pollution on springs and rivers is obvious, when we consider that the typhoid bacillus is short-lived and easily destroyed by exposure to light and oxidizing influences. In the case of rivers such as the Thames, with its numerous weirs and rapid currents, these destructive agencies are particularly active. Further, not only are these circumstances very unfavourable for the propagation of such pathogenic bacilli, but the presence of the non-pathogenic bacteria which flourish in all rivers appears to be essentially unfavourable to the propagation and life of the pathogenic bacilli; the latter disappearing in the struggle for existence." Now let them see what they did to prevent the microbe from getting into the water they supplied to London. He would take the analysis just as it stood in the last report. In the River Thames at Hampton—that was the intake of many of the Companies—the microbes on Oct. 26 were 16,700 per cubic centimetre (a cubic centimetre was about two-fifths of a cubic inch). When the water had passed into their storage reservoir, and was sent thence to the filters, the number had been reduced to 1360; and when it had passed through the filter-beds and arrived at the well at Kew Bridge, there were only 14. Now, what chance had the typhoid bacillus of passing through, when the smaller microbe could not? This was a very important point. There was everything against the pathogerm in the course of its transit along the river, even if it ever got to the intake; and the chances were hundreds of thousands against its passing through the filter-beds, even if there were typhoid in the Thames Valley. There were many who believed it to be a serious thing if they got a lot of these things into their system. The Directors had thought it desirable that some of the "very pure water" that was sold to the public to be drunk instead of that supplied by the Companies should be analyzed; and they asked Sir W. Crookes and Professor Dewar to analyze certain aerated waters. In the soda water analyzed there were 56 microbes per cubic centimetre; in the potash water, the average was 1674; and in the seltzer water, there were over 250,000. If they were charitable, they would think that Mr. Idris, in what he had said, was absolutely ignorant of the subject he was dealing with; but if they were not so inclined they would say that it was downright folly and wickedness to make such statements as he had about the London water. A strange thing was that the two men at the Thames Conservancy who were always trying to bring before the public the impurity of river water, were the very men who were most bound by their principles—certainly Mr. M'Dougall was by his temperance principles—to inculcate in the working man the importance of his drinking water. They were, however, doing everything they could to prejudice the public mind against the Thames as a source of supply, so as to force public opinion into the idea of going to Wales for water. He wanted the public to realize, not only that the water they delivered was absolutely pure, but that the water as it came to their intakes was immeasurably purer than it was some years ago, and that the efforts made by the Purification Committee of the Thames Conservancy had resulted in an immense improvement in the river. This was proved in every way—by the fish in the river, and by the experience of men who have lived on the banks for many years. They had on the Thames Conservancy men who were devoted to the river—it was the pleasure of their lives—and they would all say that the river was now in an infinitely purer state than formerly, and that the course pursued by the Companies with the landowners and others everywhere was the one which was most likely to conduce to the efficient working of the Act. They did not needlessly quarrel with or prosecute people; but they went on bringing the river into that state of beauty as well as purity, that every man who lived near the river would wish it to be in. It was no little satisfaction to those who were thoroughly acquainted with the excellence of the supply to know that it was stated by the members of the Royal Commission in 1893—after hearing all the evidence that the County Council could bring against it—that a high state of excellence and purity was attributable to the water supplied to the consumers of London, and that it was suitable in quality for all household purposes. The present Royal Commission had declared their intention of not going behind that decision; and he hoped that when the time came for the case of the Grand Junction Company to be considered, they would be able to show that they were willingly foregoing nearly 1½ per cent. of dividend to improve their position towards the public by guarding them against the consequences of frost and drought. Early next year they would have to call a Wharncliffe meeting. The expenditure on the Staines reservoirs would be more than was anticipated, arising chiefly from two things. One was that, by an improvement in design, they would be able to construct reservoirs that would hold 3300 million gallons, instead of 2500 millions. This was very satisfactory; and it could be done at very little extra cost. The unsatisfactory feature was that, though they had full power by the Act to do all the work necessary, a wretched clause had got "smuggled in" which ran quite counter to the general bearing of the Act; and they were told that this could only be cured by a fresh Act. Having to go to Parliament for this; they thought that it was just as well to be sure that they had money enough; and therefore they would have to ask for power to raise some further capital. They were being victimized right and left with respect to the value of the land. Landowners could not perhaps be blamed for asking the most preposterous prices; and wherever they could do so, they settled with them. They, however, had had considerable trouble getting possession of the land, which would cost them very much more than they had had reason before to anticipate. He concluded by moving the adoption of the report.

Viscount KNUTSFORD seconded the resolution.

Dr. LEESON said that in past years too much importance had been attached to the actual chemical impurities of water. He though that if they drank all the nitrogen they found in the water, it would rather fatten and strengthen them than otherwise. It was the germs that were the deadly and dangerous part of the impurities. He thought he was quite right in saying that no one had ever yet found a typhoid germ in Thames water; the fact of its being slightly impure was certainly against the life of typhoid organisms. If a typhoid germ got into very pure water—such as that of Loch Katrine—it would thrive fairly well; and those who drank the water would suffer. But if a typhoid germ got into the Thames, the slight impurity left by the previous germs would so act on it that it would quickly die. He lived at Twickenham; and he did not think that he had more than one or two typhoid cases a year, and those were always brought into the district. He was convinced that anyone might drink Thames water constantly without the slightest risk of anything happening. If anyone was the worse for drinking Grand Junction water, it was because he had a dirty cistern.

Mr. W. WRIGHT observed that, with regard to what had been said respecting the water supply at Maidstone, a friend of his, who came from Farleigh, had assured him that they had their water from the same well from which Maidstone was supplied; and they had not had a single case of typhoid fever. It was remarkable, if it arose from the water only, that one part of a district should suffer from typhoid, and another not.

The CHAIRMAN, in answer to Mr. James Best, said that their maximum dividend was 10 per cent., not 8½ per cent. Mr. Best had possibly misunderstood what he (the speaker) had stated at former meetings. He had said that their dividend would remain at 7½ per cent. for some years—that they would earn more, but they would not pay more, because they had to use the balance as a reserve towards the interest on the Staines capital, as well as for the sinking fund when it came into operation, for the two years before they might expect any large increase of revenue from the Staines reservoirs supply.

The motion was then carried unanimously.

The CHAIRMAN afterwards proposed the payment of the various dividends recommended.

Mr. F. TAGART seconded the motion, which was agreed to.

On the motion of Mr. BEST, seconded by Mr. GIVENS, a vote of thanks was passed to the Chairman, Directors, Secretary, and staff.

The proceedings then terminated.

Southwark and Vauxhall Water Company.—The report of the Directors for the six months ending Sept. 30 last states that the total number of new domestic supplies taken into charge during the half year was 757, estimated to produce an increased annual rental of £1690. In addition, the income derived from supplies by meter and other sources shows a satisfactory advance on the corresponding period of past years. The Directors recommend a dividend at the rate of 5 per cent. per annum on the preference stock and 6 per cent. per annum on the ordinary stock and class "D" shares of the Company.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

I understand that a gentleman has taken exception to my comment in the "JOURNAL" for the 30th ult., upon his remarks at the meeting of the Royal Scottish Society of Arts. I am always sorry when anything which I write gives pain to anyone. Whenever that happens, it may be taken for granted that it is done unintentionally. My object is not to wound, but to instruct. So much for the general situation. To come to this particular instance and the letter of complaint you forward to me, I was present at the meeting, the proceedings at which, I may say at once, were made exceedingly difficult to follow by anyone not in the habit of attending the meetings of the Society, by the fact that the names of speakers were not announced. I knew nobody who took part in the discussion, except Mr. H. O'Connor. I recollect the gentleman speaking who has since written to you. He did so at considerable length; and consequently it was impossible, in the short compass of these "Notes," to give all he said. In that respect he is in the same company as all the other speakers—Professor Ivison Macadam included. The omission of any particular passage is not, therefore, to be taken as making the report an erroneous one. He remarks in his letter that he did not say a word about the cost of Edinburgh gas. Well, as to that, hearing may be defective; but I certainly have it in my notes that he wanted to know how in Wigan, they were able to sell gas for 1s. 6d. per 1000 cubic feet, when they were going on in Edinburgh paying a high price. If the gentleman did not mention Edinburgh, and had no intention of comparing Edinburgh with Wigan, I certainly withdraw the remark, and do so readily; and, of course, along with it will go my qualifying remark about his ideas of gas supply being in a very elementary stage. In his letter to you he says he "quoted figures to show that equally good results could be obtained with gas-engines working with English gas as with Scotch gas, all which is described in your 'JOURNAL' as 'talking without knowledge.'" That is not so. His observations about the gas-engine are not mentioned at all in my "Notes," and therefore could not be described as "talking without knowledge." The remarks which he looks upon as derogatory to his professional reputation refer entirely to his views about the illuminating power of the gas. The meeting was considering carburetted water gas as part of the general supply to the community, and not the effect of different gases upon gas-engines; and it was with reference to "gas supply," and not "gas consumption in gas-engines," that my remarks were made. Now, as to gas supply, it is not matter of opinion, but of fact, that it is impracticable to lower the candle power of gas to any appreciable extent. Besides a large increase of gasholder plant which would be necessary, if the gas were reduced to (say) 20 candles, nearly the whole of the mains and services would require to be renewed; else the supply would be defective, and a constant cause of complaint. I see that the sum expended upon mains and services in Edinburgh and Leith is £211,000. Would anyone say that this expenditure should be duplicated? Even although it could be shown that the saving in the cost of gas would compensate the community for the outlay, there is this behind the question, that the Gas Commissioners could not enter houses and compel the owners to put in larger fittings. The gas service would then be inefficient; and the business of the Gas Commissioners would suffer. The lowering of the candle power of the gas would, therefore—particularly at the present time—be very much of the nature of "swopping horses in the stream;" and it would not be safe for the Gas Commissioners to attempt it, if they wish their business to go on prospering. These are the notions I entertain; and I see no reason to change them. It is possible to hold them, however, without giving offence to anyone; and as the gentleman in question has taken exception to remarks of mine which were based upon opinion, and I have no desire or interest to give him annoyance, I beg to withdraw what he has interpreted as offensive observations, and to express regret that I should have given him cause for feeling that he has been misjudged.

The Gas Committee of the Dundee Town Council on Tuesday considered, along with the other members of the Council, the subject of the enlargement of the gas-works. The Committee decided to purchase ground to the east of the works, at the price of £9300, for extension purposes. This was only agreed to, however, on a division; there being two members of the Council who considered that they should only acquire so much ground as would be required for extensions within a reasonable time. I am glad that this view was not adopted, for it is certainly better to go on with the whole scheme at once. The Committee then took up consideration of the subject of gasholder accommodation. The proposal which had been before them was that two additional lifts should be added to their largest holder—about doubling its capacity. The present guide-framing would be replaced by steel standards 125 feet high. This would, however, only increase the total storage accommodation by about 400,000 cubic feet; and it would be necessary to take down one of the present holders, and to erect a large new one on its site. The enlargement of the present holder could be done in about six months, and the new one would take about two years to construct; but when these works were completed, there would be storage accommodation, except in the Lochee suburb, for over twenty years. Regarding the gasholder proposals, the following report by Mr. William Foulis was submitted: "I have your favour of the 24th inst. [November], enclosing excerpt from minutes of the Gas Committee of 22nd inst., in which I am requested to consider and report on the suggestion that two additional lifts should be added to the largest gasholder. This suggestion does not involve any engineering difficulty in the execution of the work; and it may be accomplished either by strengthening and heightening the present framing, or by erecting entirely new framing of sufficient height, as suggested in the specification and drawings which have been sent me. Under the most favourable circumstances, I do not think you could calculate on less than eight months from the time the gasholder was placed in the contractor's hands being required for the execution of the work—or, say, from the end of February to the end of October. Any delay after this date would certainly cause serious inconvenience; and therefore strict conditions as to time of completion would require to be inserted in the contract. If your Committee resolve on adopting this

GAS AND WATER COMPANIES' STOCK AND SHARE LIST

Referred to on p. 1282.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.	£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct. 14	10½	Alliance & Dublin 10 p. c.	23½–24½	..	4 5 9	75,000	5	June 29	6	Malta & Medn., Ltd. .	5½–6	..	5 0 0
100,000	10	"	7½	Do. 7 p. c.	16½–17½	..	4 5 8	560,000	100	Oct. 1	5	Met. of Mel- ⎫ 5 p. c. Db.	11½–114	..	4 7 8
300,000	100	July 1	5	Australian 5 p. c. Db. .	107–109	+1	4 11 9	250,000	100	"	4½	bourne ⎭ 4½ p.c. Db.	107–109	..	4 2 7
200,000	5	Nov. 11	6½	Bombay, Ltd. . . .	6¾–7¼	..	4 9 7	541,920	20	Nov. 11	5	Monte Video, Ltd. . .	14½–15½	..	6 9 0
40,000	5	"	6½	Do. New, £4 paid .	5–5½	..	4 14 6	150,000	5	Nov. 26	8	Oriental, Ltd. . . .	8–8½†	..	4 14 1
380,000	Stk.	Aug. 27	12	Brentford Consolidated	300–305	..	3 18 8	135,000	5	"	8	Do. New, £4 10s. pd.	7–7½*	..	4 16 0
240,000	"	"	9	Do. New	227–232	..	3 17 7	15,000	5	"	8	Do. do. 1879, £1 pd.	1–2*	..	4 0 0
50,000	"	"	5	Do. 5 p. c. Prf.. .	145–150	..	3 6 8	60,000	5	Sep. 30	7	Ottoman, Ltd. . . .	4½–5	..	7 0 0
159,375	"	June 11	4	Do. 4 p. c. Db. Stk.	135–139	..	2 17 6	420,000	100	Nov. 2	6	People's Gas ⎫ 1st M. Bd.	104–109	..	5 10 1
220,000	Stk.	Sep. 15	11½	Brighton & Hove Orig..	273–278	..	4 2 8	500,000	100	Dec. 1	6	of Chicago ⎭ 2nd do.	103–108*	..	5 11 1
208,820	"	"	8½	Do. A. Ord. Stk. .	200–205	..	4 2 11	250,000	10	Sep. 30	10	San Paulo, Ltd. . . .	16–17	..	5 17 3
933,500	Stk.	Aug. 27	5	Bristol, 5 p. c. max. . .	130–135	..	3 14 1	135,000	Stk.	—	10	Sheffield A.	250–253	..	3 19 0
420,000	20	Sep. 30	11½	British	56–57	..	3 18 11	209,053	"	—	10	Do. B.	250–253	..	3 19 0
50,000	10	Aug. 27	11½	Bromley, Ord. 10 p. c. .	25–27	..	4 5 2	447,427	"	—	10	Do. C.	250–253	..	3 19 0
71,000	10	"	8½	Do. 7 p. c. .	20–22	..	3 17 3	5,475,000	Stk.	Aug. 12	5½	South Metrop., 4 p.c Ord	143–146	–1	3 11 11
500,000	10	Oct. 14	6	Buenos Ayres (New) Ltd	9½–10½	..	5 14 3	1,416,667	"	July 15	3	Do. 3 p. c. Db. Stk. .	106–109	..	2 15 0
98,122	Stk.	—	4	Do. 4 p. c. Db. Stk.	98–100	..	4 0 0	60,000	Stk.	Sep. 15	12	Tottenham and ⎫ A. .	280–290	..	4 2 9
150,000	20	July 15	8½	Cagliari, Ltd. . . .	30–32	..	5 3 1	60,000	"	"	9	Edmonton ⎭ B. .	205–215	..	4 3 9
100,000	10	Sep. 30	8	Cape Town & Dis., Ltd.	16½–17½	..	4 11 5	182,380	10	May 27	8	Tuscan, Ltd.	13½–14½	..	5 10 1
50,000	50	Nov. 2	6	Do. 6 p. c. 1st Mort.	59–61	..	4 18 5	149,900	10	July 1	5	Do. 5 p. c. Dbs. Red. .	102–105	..	4 15 3
550,000	Stk.	Oct. 14	13½	Commercial Old Stock .	340–345	..	3 18 3								
196,483	"	"	10½	Do. New do. . .	255–260	..	4 0 9								
196,309	"	June 11	4½	Do. 4½ p. c. Lb. do.	155–158	..	2 16 11					WATER COMPANIES.			
800,000	Stk.	June 11	12†	Continental Union, Ltd.	257–262	..	4 11 7								
200,000	"	"	9†	Do. 7 p. c. Prf. .	218–223	..	4 0 8	746,164	Stk.	June 29	10½	Chelsea, Ord.	337–342	..	3 1 5
51,600	Stk	Aug. 27	14	Croydon A 10 p. c. . .	315–320	..	4 7 6	150,000	"	"	5	Do. 5 p. c. Prf. . . .	177–180	..	2 15 6
163,400	"	"	11	Do. B 7 p. c. . .	252–257	..	4 5 7	160,000	"	"	4½	Do. 4½ p.c. ⎫ f. Stk., 1875	157–160	..	2 16 3
535,000	Stk.	Aug. 12	5½	Crystal Palace Ord. 5 p c.	138–142	..	3 13 11	175,785	"	Sep. 30	4½	Do. 4½ p. c. ⎭ Lb. Stk. .	160–165	..	2 14 6
60,000	"	"	5	Do. 5 p. c. Prf. .	140–143	..	3 9 11	1,720,560	Stk.	Oct. 14	7½	East London, Ord. . .	232–236	..	3 8 8
486,090	10	July 29	11	European, Ltd. . . .	26–27	..	4 1 6	654,740	"	June 29	4½	Do. 4½ p. c. Db. Stk.	163–166	..	2 14 3
354,060	10	"	11	Do. £7 10s. paid .	18½–19½	+½	4 4 7	390,000	"	"	3	Do. 3 p. c. Db. Stk..	106½–107½	..	2 15 10
5,896,590	Stk.	Aug. 12	12½	Gaslight & Coke, A, Ord.	315–316	–2	4 0 8	700,000	50	June 11	7½	G'd Junct'n, 10 p. c. max.	123–128	..	2 18 6
100,000	"	"	4	Do. B, 4 p. c max. .	113–118	..	3 7 10	295,000	Stk.	Sep. 30	4	Do. 4 p. c. Db. Stk.	147–152	..	2 12 8
665,000	"	"	10	Do. C, D, E, 10 p. c. Prf.	317–322	..	3 2 2	708,000	Stk.	Aug. 12	13	Kent	362–367	..	3 10 10
30,000	"	"	5	Do. F, 5 p. c. Prf. .	150–155	..	3 4 6	160,000	"	"	7	Do. New, 7 p. c. max..	215–220	..	3 3 7
60,000	"	"	7½	Do. G, 7½ p. c. do. .	322–227	..	3 6 1	1,043,800	100	June 29	10†	Lambeth, 10 p. c. max..	307–312	+2	3 4 1
1,300,000	"	"	7	Do. H, 7 p. c. max. .	204–209	..	3 7 0	406,200	100	"	7½	Do. 7½ p. c. max..	227–232	..	3 4 8
463,000	"	"	10	Do. J, 10 p. c. Prf. .	317–322	..	3 2 2	350,000	Stk.	Sep. 30	4	Do. 4 p. c. Db. Stk.	147–150	..	2 13 4
476,000	"	"	6	Do. K, 6 p. c. Prf. .	182–187	..	3 4 2	500,000	100	Aug. 12	13	New River, New Shares	450–455	..	2 17 1
1,061,150	"	June 11	4	Do. 4 p. c. Db. Stk. .	139–142	..	2 16 4	1,000,000	Stk.	July 29	4	Do. 4 p. c. Db. Stk.	152–155	..	2 11 7
294,850	"	"	4½	Do. 4½ p. c. do. .	156–159	..	2 16 7	902,300	Stk.	June 29	6†	South'w'k & V'xhall, Ord.	164–167	+1	3 11 10
908,000	"	"	6	Do. 6 p. c. do. .	207–212	..	2 16 7	126,500	100	"	6†	Do. do. 7½ p. c. max..	152–155	+1	3 17 5
70,000	10	Oct. 28	8	Hongkong & China, Ltd.	14–15	..	5 6 8	489,200	Stk.	"	5	Do. do. 5 p. c. Prf. .	175–180	..	2 15 6
3,800,000	Stk.	Nov. 11	10	Imperial Continental .	215–220	..	4 10 11	1,019,585	"	Oct. 14	4	Do. 4 p. c. A Db. Stk.	144–147	..	2 14 7
376,400	100	Aug. 3	4	Do. 4 p. c. Dbs. Red.	99–102	..	3 18 5	1,155,066	Stk.	June 11	10	West Middlesex . . .	320–325	..	3 1 6
473,600	Stk.	Aug. 12	3½	Do. 3½ p. c. Db. Stk. "	104–107	..	3 5 5	200,000	"	"	4½	Do. 4½ p. c. Db. Stk.	163–166	..	2 14 3

* Ex div. † Next dividend will be at this rate.

proposal, a general specification should be prepared, and estimates obtained from several of the leading gasholder makers as early as possible. I would like to point out that, with this addition, there would be no more than sufficient gasholder accommodation for present requirements; and that almost immediately an additional gasholder will require to be constructed. It would be unwise, for economical reasons, to make this of less than 3 million cubic feet capacity. It could easily be completed in twelve to fifteen months; and this would meet the increase in consumption for a considerable number of years. Let me ask, Would it not be more prudent to face this expenditure, which can only be shortly delayed, now, and save the £10,000 or £11,000 required to enlarge the existing holder? There might be some extra trouble required to meet next winter's demand; but that could be no serious difficulty." The Committee, after giving the matter their consideration, were of opinion that plans and specifications should be prepared for a new holder; and they instructed Mr. W. M'Crae, their Engineer, accordingly. The question of site for the new holder was held over. The Committee gave instructions to communicate with other towns with reference to a proposal to introduce carburetted water-gas plant into the intended works.

The Falkirk Gas Committee have temporarily stopped the working of the Peebles oil process, on account of the rise in the price of oil; and the gas supply is now being made entirely from coal. This is one of the effects of the success of the system, and of the extended use of oil in other processes. Cannel is now so cheap that there is little advantage in the use of oil. But, remove the oil-plants, and cannel would again go up. It thus works out that, if cheap coal be a desideratum, it is not advisable to renounce those processes which help to keep its price down. The Town Council, not the Gas Committee, this week considered the appointment of an official Gas Tester. There were eight applications for the post, but only three went to a vote. The Convener of the Lighting Committee (Mr. Russell) moved the appointment of Mr. H. O'Connor, of Edinburgh. Mr. Cormack and Mr. Fraser, both local gentlemen, were also nominated. The final vote laid between Mr. O'Connor and Mr. Cormack; and the votes being equal, Provost Weir gave his casting vote in favour of Mr. Cormack. The Council only recommend; it is the Sheriff who makes the appointment. There was a strong partisan feeling in the Council; and a warm discussion took place before the voting.

North Berwick as a health resort is, to use a popular expression, rising rapidly. There is but one blot upon the fair face of this otherwise smiling retreat—the gas-works are situated at the entrance to the town from the railway. Visitors are supposed to receive a bad impression of the town from having the gas-works obtruded upon their vision the moment they set foot within it. The gas undertaking is the property of the Corporation, some members of which are of the mind that they might afford to have the works removed; and a Committee has been appointed to consider the subject. The latest suggestion is that the works should be removed to the village of Dirleton, about three miles out; and they would then be available for the service of Dirleton and Gullane, as well as North Berwick. The scheme is a little ambitious; but the people are enterprising, and something like it may yet be carried out.

Though not altogether a gas subject, I think it right to mention the meeting of the Scottish Section of the Society of Chemical Industry, which was held at Broxburn on Monday last week. Oil-works managers make large quantities of gas in the course of their working of the shale. It seems that they have hitherto been more disposed to "take it as it comes," than to endeavour to improve upon it. It is only of recent years, and in one works, that they have been able to make the gas produced do the whole of the firing. The proposal of Mr. Henderson, of Broxburn, that oil-works managers should regularly analyze the gases produced in their retorts, would doubtless lead to improvements in their gas, and the cheapening of the oils produced. It is of significance to gas managers to learn that within the past thirty years, the cost of the production of oil has been reduced by about one-half. Gas managers have thus not been alone in the march of progress.

The Edinburgh and District Water Trustees propose to raise £200,000 of capital under their Bill before Parliament. Of this, £61,000 is, or has already partly been, expended in connection with the existing water supply from the Moorfoots. Treasurer M'Crae is averse to spending money on the Moorfoot system, seeing that a new supply is being brought in from the Tweed. I suppose, however, the Trustees cannot help themselves. The supply is running short; and as it will be nearly ten years before the Talla water can be got into the city, the only thing which can be done is to try to get more from the existing sources. With this in view, the Gladhouse reservoir is to be enlarged, and a new line of pipes laid from it to Alnwickhill. This part of the work is to be pushed on. The Trustees this week accepted the offer of Messrs. James Young and Sons, of Edinburgh, to lay the new main, at a contract price of £9812. Only half the work, however, is to be proceeded with under this acceptance.

Ossett Corporation Borrowing Powers and Sinking Funds.—Colonel Coke, one of the Inspectors of the Local Government Board, held an inquiry at Ossett last Tuesday in regard to an application by the Corporation for a Provisional Order to amend the Local Act of 1875, in order to extend by £5000 the borrowing powers conferred by the Act for water-works purposes, and so that sinking funds for the repayment of loans raised under the Act might, if the Corporation thought fit, be invested in loans to District Councils and Boards of Guardians, instead of being restricted to investment in Consols. The application had the unanimous approval of the Corporation; and there was no opposition.

Municipalities and their Contracts in the United States.—The "Engineering Record" recently published the full text of an important decision of the Supreme Court of Illinois, written by Chief Justice Phillips. The city of Danville made a contract with the Danville Water Company for the use for thirty years of an indefinite number of hydrants at a scheduled rate of payment. Before the expiry of the term, the city authorities tried to break the contract, and force lower prices on the Company. The latter continued to supply water, but resisted the attempt to scale down their income arbitrarily. Justice Phillips has sustained this view of the matter; and, in his decision, he reminds the city of Danville that it has no more right to break a contract than a private person.

R. & A. MAIN, Ltd.

Argyle Works, GLASGOW.
Telegrams: "GASMAIN, GLASGOW."

BIRMINGHAM:
1, OOZELLS STREET.
Telegraphic Address: "GOTHIC."

109, Farringdon Rd., LONDON.
Telegrams: "GASMAIN, LONDON."

BRISTOL:
28, BATH STREET.
Telegraphic Address: "GOTHIC."

MANCHESTER:
37, BLACKFRIARS STREET.
Telegraphic Address: "GOTHIC."

THE
"DUCHESS"
GAS-FIRE.

THE
"DUCHESS"
GAS-FIRE.

SIZES.

	WIDE. Inches.	HIGH Inches.	FIRE. Inches.
No. 451	20	29	8½
No. 452	22¼	30¼	10
No. 453	25½	31½	13

PRICES.

No. 451. .	£2 15 0
No. 452. .	£3 3 0
No. 453. .	£3 12 6

For full Particulars

See our Lists.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—The better qualities of round coal, though not perhaps hanging quite so much on the market as recently, are still moving off but slowly; and collieries are not more than able to get rid of their present output—stocks remaining untouched. Quoted prices at the pit mouth are unchanged from last week. Common round coals continue in only moderate request; the unsettled outlook in the engineering trade checking present improvement. Not more than 6s. 6d. per ton at the pit mouth is being obtained for good qualities. The breakdown of the threatened stoppage of the cotton mills to enforce a reduction in wages, has necessarily improved the outlook as regards engine fuel. There are, however, ample supplies of slack on the market; and inferior qualities are offered very low. Prices generally are, however, steady on the basis of about 3s. to 3s. 6d. per ton at the pit for inferior qualities; 3s. 9d. to 4s. 3d., for medium; and 4s. 6d. to 4s. 9d., for better descriptions. For shipment there is a fair inquiry, with common steam coal obtainable at 7s. 9d. to 8s. per ton, and better qualities at 8s. 3d. to 8s. 6d., delivered at the ports on the Mersey.

Northern Coal Trade.—There has been a better demand for coal in the last few days; but the stormy weather has interfered with the shipments, so that some of the collieries have had to work short time occasionally. Best Northumbrian steam coals are steady at 8s. per ton f.o.b., though some sales have at times been made below this rate, to enable collieries to keep fuller at work. Second-class steam coals are 7s. 6d. per ton; and steam smalls, 3s. 3d. There is a very strong demand for gas coals; and it is difficult to get supplies beyond the quantities contracted for. Where such occasional lots are to be had, the price quoted is at least 8s. per ton f.o.b. Manufacturing coals are very dull. Gas coke is steady; but prices show no change this week.

Scotch Coal Trade.—There is almost no change to record. The demand is not quite so active; but there is no alteration in rates. Prices are: Main, 6s. 9d. to 7s. per ton f.o.b. Glasgow; ell, 7s. 3d. to 7s. 6d.; and splint, 7s. 6d. Stormy weather has interfered with shipping. The shipments amounted to 148,850 tons—a decrease of 17,071 tons on the previous week, but an increase of 11,505 tons over the corresponding week of last year. For the year to date, the total shipments have been 7,615,416 tons—an increase on the same period last year of 413,617 tons.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Dec.* 11.

Sulphate of Ammonia.—The week opened with a quiet market. But a better tone has since supervened; and the closing quotations are £8 15s. per ton f.o.b. Hull, and £8 17s. 6d. per ton f.o.b. Leith and Liverpool. Exports to the end of November show an increase of about 25,000 tons over those in 1896, January-November, or nearly 22 per cent.—indicating a continued improvement in the statistical position. Makers generally have maintained a firm attitude; and there has nowhere been any great pressure to sell. Second-hand parcels, which were offering at under makers' prices, have all been removed; and the low quotations abroad, which have recently been troubling the market, having been withdrawn, consumers have again come forward, and a satisfactory business has been done. In Scotland, where last week there was most depression, there has been most improvement; and within the past few days, good business has been done at full prices. In the forward position, there would no doubt be buyers at last prices paid; but makers now require an advance of 2s. 6d. to 5s. per ton.

Nitrate of Soda is firm at 7s. 7½d. per cwt. for good, up to 7s. 9d. per cwt. for refined quality, on spot.

LONDON, *Dec.* 11.

Tar Products.—Benzol has evidently touched rock bottom; and there is apparently a better outlook for it. A large business has been done at prices noted below. Fortunately, makers are well sold; and they look with some indifference upon the partially successful operations which have been going on to depress this article. There is a better tone in regard to pitch, if the increased business is any index, though the price is lower than it has been for some years. Carbolic acid is firm, with a ready market at the quoted price. Naphthalene buyers are more hypercritical as to quality; the most recent specification for this article by a large buyer not being at all an easy one to comply with. Creosote is steady at advanced rates; while anthracene is firm at the Committee's prices.

Business has been done during the week at the following average rates, which, of course, embrace transactions throughout the United Kingdom: Tar, 14s. to 19s. Pitch, 16s. to 19s., according to port. Benzols, 90's, 1s. 8d.; 50's, 1s. 10d. Toluol, 2s. 1d. Solvent naphtha, 1s. 7d. Crude, 30 per cent. naphtha, 9d. Creosote, 2¼d.; liquid, 2¾d. Heavy oils, 45s. Carbolic acid, 60's, 2s. Naphthalene, 55s.; salts, 30s. Anthracene, "A," 5d.; "B," 4d. to 4½d.

Sulphate of Ammonia is again in good request. The effort to "bear" the article has been of a transient character. A large business has been done at £8 15s. to £8 17s. 6d., less 3½ per cent., according to port of shipment. The market is firm, with an advancing tendency.

Smoking Concert at the Midland Iron-Works.—A very pleasant evening was spent by the employees at the Midland Iron-Works, Donnington, on the occasion of the fifth annual smoking concert, which took place, by permission of the Executors of the late Mr. C. C. Walker, in the dining hall, on Saturday, the 4th inst. Mr. Alfred Featherstone presided; and there was a large attendance. A long and varied programme was gone through; the most successful item in which, from a local point of view, was a humorous song by Mr. R. J. Melbourne, entitled "The Greatest Works on Earth." This composition, which was of considerable length, brought in the names of most of the principal employees connected with the establishment; and it was enthusiastically received. Votes of thanks and the singing of the National Anthem brought the enjoyable proceedings to a close.

RICHMOND & CO., Ltd.

Works: STRATFORD, E., & WARRINGTON.

Show-Rooms: 132, QUEEN VICTORIA ST., E.C. & ACADEMY STREET, WARRINGTON.

THE

"MONARCH" HALL STOVE.

(Registered.)

VERY RICH EFFECT.

NO FLUE NEEDED.

LUMINOUS FLAME.

	No. 1500.	No. 1502.
Plain	£5	£7 10s.
Tiled	£6	£9 0s.
Vic. Bronze	£9	£12 0s.
Art „	£12	£15 0s.

Or with Fuel Fire and Flue same Price.

The East Northumberland Water Scheme and the Supply of Cowpen.—The large water scheme which was recently proposed for East Northumberland, and to which reference was made in the "JOURNAL" for Oct. 12, has fallen flat; and the authorities who, it was hoped, would share in it, do not seem very eager to do so. It may be remembered that the scheme emanated from the Cowpen District Council; and this body has now come to the conclusion that the only alternative left to them is to undertake a scheme of their own. To this end, they have decided to solicit an interview with Lord Armstrong, with the object of obtaining his permission to utilize a portion of the water flowing from the Simonside Hills, at Great Tosson, and emptying itself into the River Coquet at Rothbury, for the purpose of procuring an adequate supply of pure water to meet the increasing requirements of the district. It is believed by the Chairman of the Council (Mr. C. Barron) that they will be able to get permission to secure about 400,000 gallons per day, which is about a quarter of the yield of the Tosson Springs, and that the total cost will only amount to something like £40,000.

Heywood Corporation Water Bill.—A meeting of property owners and ratepayers of Heywood was held last Wednesday to determine upon the expediency of consenting to the promotion by the Council of a Bill to extend the time for the construction of certain reservoir, aqueducts, and other works authorized by the Heywood Water-Works Act of 1877, to empower the Corporation to purchase and retain land, and to borrow money for water-works purposes. The Mayor (Alderman Healey) moved a resolution consenting to the promotion of the Bill; and he explained that the Council wanted an extension of time wherein to construct the reservoir at Ashworth Moor. Borrowing powers were also required for the strengthening of the embankment of the Nayden Higher reservoir. The Engineer estimated that the carrying out of the Ashworth Moor scheme would involve an expenditure of £55,000; and £10,000 would be required for strengthening the embankment. The Ashworth Moor scheme was considered to be a good one; and it would be used in conjunction with the existing scheme in the Nayden Valley. The resolution was carried with only one dissentient.

Matlock Water-Works Purchase Scheme.—A well-attended meeting of the ratepayers of Matlock was held last Tuesday, to authorize the promotion by the District Council of a Bill in the coming session of Parliament for, among other things, the acquisition of the water-works and the improvement of the supply. Mr. E. Slack, J.P., who presided, said the Council had come to terms with the Water Company for the purchase of their undertaking for £18,550. A scheme had been prepared by Mr. Rofe for improving the supply; including a large reservoir capable of holding 109 million gallons of water. Dealing with the question of cost, he said this would be £45,000 at the very outside, and perhaps it might only be £35,000. But putting the expense at the utmost limit, for a few years, it would mean a burden on the rates of £600 or £700 a year, which would be covered by 6d. in the pound increase of the general district rates. This would soon be wiped out, however; and the outlook showed that with the new supply there would be an abundance of water, and they could supply part of Darley Dale, and the whole of Matlock except Riber Hill Top, which could be dealt with by a small separate scheme if necessary. A resolution consenting to the promotion of the Bill was passed.

Bristol Town Council and the Water-Works.—Upon the *agenda* paper at the last meeting of the Bristol Town Council was a notice by Mr. Sharland of his intention to ask why the Committee appointed to inquire as to the terms upon which the undertaking of the Bristol Water Company could be acquired for the city had not reported, and when a report from them might be expected. When the item was reached, Mr. Sharland said he had received a communication from Alderman Howell Davies in regard to the matter; but it was such a serious thing for a Committee to be appointed with certain instructions, and then to allow three years to go by without doing anything, that he intended to move a resolution. In his letter, Alderman Davies stated that the reason why nothing had been done during the past twelve months was on account of the severe pressure which had been put upon the Town Clerk's department by the boundaries extension and other matters, and that he (the Alderman) hoped to have the report ready by February or March next. Mr. Sharland concluded his remarks by moving a resolution expressing the regret of the Council that the Committee had not made a report. Mr. A. Levy Langfield seconded the motion, because he believed it would be beneficial if the works became the property of the city. The motion was unanimously carried.

Street Lighting in Liverpool.—The Lighting Committee of the Liverpool Corporation held their first official inspection of the street lighting of the city last Wednesday evening; but before commencing their perambulation, the members and officials of the Department dined together, on the invitation of the Chairman (Mr. Charles Petrie). Responding to the toast "Success to the Lighting Committee," Mr. Petrie remarked that the purchase of the electric lighting system had revolutionized the lighting of the city. The total number of street-lamps of every class was 14,254, lighting 409½ miles of streets, 561 passages, and 1350 courts. Of these 133 were electric lamps, lighting 3¾ miles of road, and 1593 incandescent gas lamps, lighting 32½ miles of road. The work of the year had included the fixing of 97 arc lamps, lighting 2½ miles of road, 1194 double incandescent lamps, lighting 19¼ miles of road, 108 single incandescent lamps, lighting 1¾ miles of road, 181 ordinary lamps, lighting 7 miles of road, and 248 passage lamps, lighting 6244 back doors. It was proposed in 1898 to light an additional 27 miles of main arteries of the city by means of 1077 incandescent gas-lamps, in lieu of ordinary ones, and to fix lamps in 400 passages hitherto unlighted, in addition to the lighting of new streets. The lighting of passages was a great boon to the poorer classes; and it was an almost appalling thing that a few years ago there were 1800 or 1900 such dark places without any light at all. The incandescent light had been a great success, and they were greatly indebted to their Superintendent (Mr. C. R. Bellamy), who had patented a very valuable lamp. While the Committee intended to largely extend the incandescent lighting of the main thoroughfares, they did not contemplate increasing the electric lighting very much at present, as they preferred to await the development of the new tramway scheme.

JOSEPH AIRD
GREAT-BRIDGE,
STAFFORDSHIRE.
HIGHEST QUALITY
TUBES AND FITTINGS
GAS, STEAM, WATER, GALVANIZED TUBES and FITTINGS in all Sizes.
LARGE TUBES FOR COLLIERIES.
Illustrated Price Lists on Application.
LONDON OFFICES: 46, QUEEN VICTORIA STREET, E.C.

Filey Gas and Water Works Purchase Question.—At the meeting of the Filey District Council last Tuesday, a letter was read from the Secretary of the Gas and Water Company, informing the Council that the Directors saw no reason to alter their previous decision not to sell the undertaking, and declining to meet the Authority. Several members expressed regret at this decision of the Directors; and one hoped the Council would not be faint-hearted, but would persevere in their determination to obtain the undertaking by compulsory powers. It was also suggested that the Council might again approach the Company and offer a price; but this was strongly opposed, it being considered that the adoption of such a course would be playing into the hands of the Directors. Ultimately the matter was referred to the Special Committee who are dealing with the question.

The New Water Reservoir for Merthyr Tydfil.—The members of the Water Committee of the Merthyr Tydfil District Council recently visited the new reservoir which is being constructed for them by Messrs. Holme and King. They found that considerable progress had been made, especially with the important work of erecting the extension dam across the valley. The head of water to be enclosed will, it is calculated, amount to 350 million gallons—a supply which is counted upon not only for the purpose of an increased parish population, but also for the possible requirements of outside authorities to the extent of 1¾ million gallons per day. The total expenditure on the reservoir, land, &c., will be £120,000. The height of the dam will be about 50 feet above the level at present attained; and the water will stand at an elevation of 1500 feet—allowing the highest part of the parish of Merthyr and the places beyond to be easily supplied by gravitation. The work is expected to be completed in about three years.

The Competition Between Gas and Electric Lighting in America.—The following recently appeared in the "New York Herald:" "Competition between the electric and gas companies has become so keen that the former have decided to bid for public favour by making a reduction in rates. This is regarded in business circles as the beginning of a bitter war, which is likely to have a far-reaching effect, and possibly lead to a radical reduction in gas charges, or, what will amount to the same thing, an extension of discounts for long-hour use to customers having bills exceeding a certain amount. The Edison Electric Illuminating Company of New York started the ball rolling by announcing that, in addition to their new wholesale schedule, they would extend their discounts for long-hour use to customers having gross bills of $50 a month. This privilege is to be extended for prompt payment only, and the discounts are to be as follows: 5 per cent. for two hours, 10 per cent. for three hours, 15 per cent. for four hours, and 20 per cent. for five hours consumption of electricity per day. The reduction becomes operative on all November bills that fall in this category."

New Storage Reservoir for Cardiff.—Arrangements for the construction of a new storage reservoir for Cardiff have been completed. The Corporation have purchased six acres of land on the top of Penylan Hill; but only half of this will be utilized for the new reservoir. This, which will be an open one, is to be 315 feet long by 130 feet in breadth, and 12 feet in depth, and will have a capacity of 3 million gallons. The ground cost £5000; and the contract for the construction of the reservoir is £9419. The total cost, exclusive of the land, will be between £10,000 and £11,000. The circumstances that have led the Corporation to construct the new reservoir are these: A considerable portion of the town and district can only be supplied by the high-level service. In the event at any time of a stoppage in the main conduit from the Taff Fawr reservoir, these districts are at present solely dependent upon the Rhubina reservoir, which only holds ½ million gallons, or merely a ten days' supply for these districts. At present, in the event of any stoppage in the Taff Fawr mains, the district in question would be in danger of water famine; but by the construction of the new reservoir, such emergency will be obviated.

Water-Works Improvements at Barry.—A Local Government Board inquiry was held last Tuesday at Barry Dock by Colonel C. H. Luard, regarding an application by the District Council for power to borrow £3767 for laying a 6-inch main from their Pencoldtre reservoir to a 4-inch branch main running to Dinas Powis from the Llandough reservoir of the Cardiff Corporation. The Clerk (Mr. J. A. Hughes) stated that at the present time there was an agreement between the latter body and the District Council for a supply of 20 million gallons of water from the Llandough reservoir; but last year only 2,397,000 gallons had been used—leaving a balance of 17½ million gallons. The 6-inch main proposed would deliver approximately 50 million gallons a year, or at the rate of 800,000 gallons in twelve hours. Barry simply desired to have two strings to their bow in reference to the water supply; and, besides, Cardiff water was very much softer than that of Barry. The reason why a 6-inch main was proposed to meet a 4-inch one was because the cost would be very little more, and it was hoped that Cardiff would some day extend it within their district, and connect it with the reservoir. One of the members of the Council (Mr. Saunders) opposed the scheme, and adversely commented upon the present administration of the department.

The New Conveyor Company, Limited, of Smethwick, have been entrusted with the contracts for installations of inclined retorts at the Corporation Gas-Works, Middleton (Lancs.), and at the Cambridge Gas-Works. Both installations will be equipped with complete patent overhead continuous storage tanks, measuring chambers, "sure-feeds," and an improved form of independent charging-shoots; also with very efficient systems of automatic elevating and conveying plant.

Messrs. Richmond and Co., Limited, have been awarded a diploma and gold medal for their exhibits at the third Yorkshire Trades and Industrial Exhibition, recently held at Sheffield. The Company made a full display of gas-stoves for cooking and heating purposes, consisting principally of their "Model" cookers, the "National" and "Universal" prepayment meter cookers, the "Pickwick" grillers, the "Dragon" gas-fire, and several of this season's new pattern gas-fires. Among the latter were the "Neptune" (the largest gas-fire yet made), the "Dragon" condensing stove, the "Louis XIV." luminous-flame stove, and the "Stratford" nursery gas-fire. The new patterns attracted great attention.

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

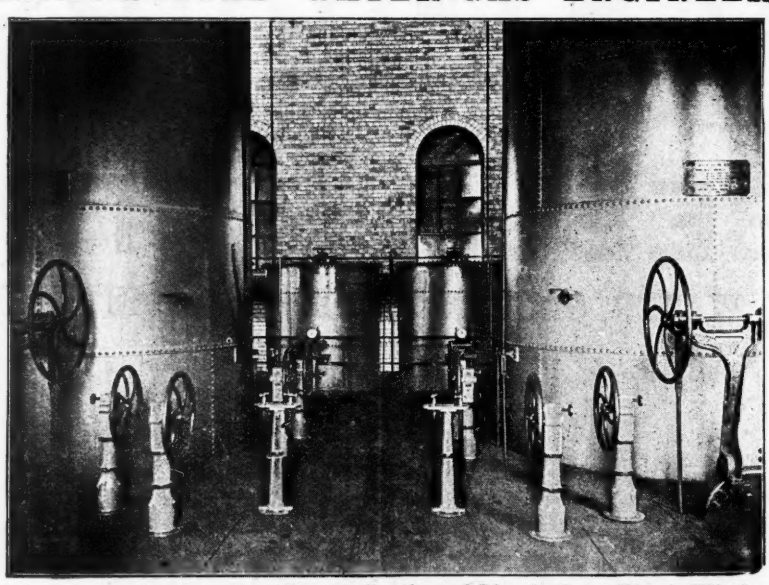
The Economical Gas Apparatus Construction Co., Ld.

London Offices: 19, ABINGDON STREET, WESTMINSTER, S.W.
American Offices: TORONTO. TELEGRAPHIC ADDRESS: "CARBURETED, LONDON."

W. H. PEARSON, Chairman.
W. H. PEARSON, Junr., Deputy-Chairman.
J. T. WESTCOTT, M.E., Manager.
L. L. MERRIFIELD, M.Inst.M.E., Engineer.

CARBURETTED WATER-GAS ENGINEERS.

THE M.-W.-P. PLANT is designed to use the Heaviest as well as the Lightest Grade of Oil.



RESULTS PROVE EFFICIENCY.

Working Floor of Generator House. One Quarter Section of Birmingham Plant, Windsor Street Station.

The Maximum Daily Capacity of the Birmingham Corporation's Plant, which was erected by this Company, is 10 MILLION CUBIC FEET.

GWYNNE & BEALE'S
PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM, LONDON." Telephone No. 65,095. Holborn.

GWYNNE & CO.,

HYDRAULIC AND GAS ENGINEERS,

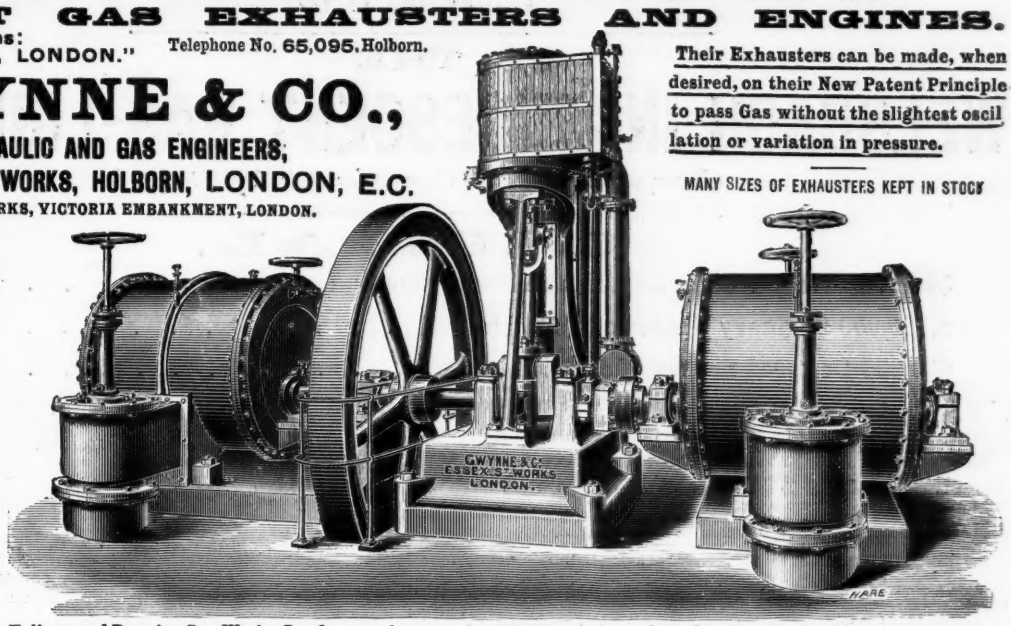
BROOKE STREET WORKS, HOLBORN, LONDON, E.C.

Late ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON.

They have completed Exhausters to the extent of 35,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, PATENT RETORT-LIDS, STEAM-PUMPS for Tar, Liquor, or Water; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.



Their Exhausters can be made, when desired, on their New Patent Principle to pass Gas without the slightest oscillation or variation in pressure.

MANY SIZES OF EXHAUSTERS KEPT IN STOCK

Exhausting Machinery at Fulham and Bromley Gas-Works, London—each set passing 400,000 cub. ft. per hour drawing 14 miles distant from Beckton.

Catalogues and Testimonials sent on application.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS, should be received not later than the FIRST POST on SATURDAY.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
JOHN WM. O'NEILL, Managing Director, Palmerston Buildings, Old Broad Street, London, E.C.

ANDREW STEPHENSON, AGENT. All communications re Oxide to be addressed to Palmerston Buildings.

WINKELMANN'S "VOLCANIC" CEMENT. Fire Resistance up to 4500° Fahr. In use in most Continental Gas-Works, and in more than 300 British Gas-Works.
ANDREW STEPHENSON, 182, PALMERSTON BUILDINGS, OLD BROAD STREET, LONDON, E.C.
Telegrams: "Volcanism, London."

AMMONIACAL LIQUOR wanted.
BROTHERTON AND CO., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

GAS TAR wanted.
BROTHERTON AND CO., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SPENT OXIDE wanted.
BROTHERTON AND CO., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SULPHURIC ACID for Sale.
BROTHERTON AND CO., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

BROTHERTON & CO.
Offices: Commercial Buildings, LEEDS. Correspondence invited.

PATENTS FOR INVENTIONS.

J. C. CHAPMAN, M.I.M.E., and Fel. Chartered Inst. Patent Agents. ADVICE ON ALL MATTERS CONNECTED WITH ABOVE. Information and Handbook on application.
70, CHANCERY LANE, LONDON, W.C.

SADLER & CO., Ld., Middlesbrough; ULVERSTON (BARROW); PORTSMOUTH; CARLTON (N.E.R.); and STOCKTON. Tar and Petroleum Distillers. Benzol and Petroleum Spirit, 700 and other Gravities specially prepared for Carburetting. SOLAR OIL for Gas Making, Kerosene, &c.
Correspondence invited.
Telegraphic Address: "SADLER, MIDDLESBROUGH."

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Address: "Braddock Oldham."

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Limited, Chemical Works, Leeds, specially produce this ACID from SULPHUR, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER LINCOLN."
[For Illustrated Advertisement, see Dec. 7, p. 1218.]

LLEWELLYN JONES & T. B. YOUNGER, CONSULTING ENGINEERS, VALUERS, &c., CHESTERFIELD HOUSE, 98, GREAT TOWER STREET, E.C.

CANNEL, COAL, ETC.

JOHN ROMANS & SON, EDINBURGH, Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS and WATER WORKS.
Prices, &c., will be forwarded on application to No. 30, ST. ANDREW SQUARE, EDINBURGH, or NEWTON GRANGE, NEWBATTLE, DALKEITH, SCOTLAND.

NEW GAS PLANT CEMENT.

JOHN E. WILLIAMS AND CO., VICTORIA PAINT WORKS, MANCHESTER.
For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

TUBES for Gas, Steam, and Water (all Sizes) Welded or Riveted. TANKS, HYDRAULIC MAINS, RETORT-LIDS, &c.
JOHN SPENCER, Globe Tube Works, WEDNESBURY; and 14, Great St. Thomas Apostle, LONDON.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. **Compare Prices and Particulars before ordering elsewhere.**
J. F. BLAKELEY, Gas Engineer, Ravensthorpe, YORKS.

GAS PURIFICATION.

OXIDE OF IRON BOG ORE.

BALE & CO.'S Oxide of uniform quality. SPECIAL FIRE CEMENT, OXIDE PAINTS, OILS, SULPHURIC ACID, &c.
120 and 121, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE, LONDON."

SULPHATE OF AMMONIA SATURATORS.

JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c., CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special attention to Repairs.
Before placing Orders, please write for Estimate.

TO GAS AND WATER OFFICIALS.

DON'T forget to Order your 1898 Cycle from the MELROSE CYCLE COMPANY, COVENTRY.

HUTCHINSON BROTHERS, Gas Engineers, &c., Falcon Works, Barnsley, Makers of Wet and Dry Gas-Meters, Brass-Work, and general Gas Apparatus, Lead Saturators, Tanks, &c., Tools, and Gas-Works Sundries. (See p. 1210, last week's issue.)
Telegrams: "HUTCHINSON BROS., BARNSLEY."

IMPORTANT.

OLD Retorts made equal to new by repairing them with CROWTHER'S PATENT STICKFAST FIRE CEMENT. Unequalled for Repairing Inclines. Can be used in Hot or Cold Retorts; and "A1." for Mouthpiece Joints. Satisfaction Guaranteed.
CROWTHER, Practical Retort Setter, Manor Street, HUDDERSFIELD.

SULPHATE OF AMMONIA SATURATORS.

WALTER THOMASON and SONS, Chemical Plumbers, &c., and Makers of Lead Saturators, &c., 21, WESTON STREET, BOLTON. Repairs of every description.
Please write for Estimate before ordering elsewhere.

HYDRATED OXIDE OF IRON.

PREPARED from pure Iron.
Two or three times as rich as Bog Ore.
Strong action on Sulphuretted Hydrogen.
To be used alone, but will increase activity of other Oxides.
Less than half the price of Bog Ore.
Can be lent on hire.
Write for tabulated results.
READ HOLLIDAY AND SONS, LIMITED, HUDDERSFIELD.

WANTED, a Situation as Gas-Fitter, MAIN and SERVICE LAYER, INDEX READER, &c. Would have no objection to do Stoking if required.
Address JONES, Gas-Works, CRICKHOWELL.

The APPLICATION LIST will OPEN on THURSDAY, Dec. 16, and CLOSE on or before Four p.m. on FRIDAY, Dec. 17, 1897.

THE WELSBACH INCANDESCENT GAS-LIGHT CO., Ltd.

Incorporated under the Companies Acts, 1862 to 1893.

CAPITAL.

300,000 Five per Cent. Cumulative Preference Shares of £5 each £1,500,000

1,350,000 Ordinary Shares of £1 each 1,350,000

650,000 Deferred Shares of £1 each 650,000

The Articles of Association provide that no Debentures or Debenture Stock secured by any Mortgage or charge on the Company's assets, or any part thereof, shall be created without the sanction of an Extraordinary Resolution of the Company, and an Extraordinary Resolution of the holders of the Preference Shares.

The PREFERENCE SHARES are entitled to a fixed Cumulative Preferential Dividend of 5 per cent. per annum, and rank, both as regards such Dividend and Capital, in priority to all other Shares in the original Capital, but do not confer any further right to participate in Profits or Assets.

The ORDINARY SHARES are next entitled to a cumulative Preferential Dividend of 7 per cent. per annum, and rank as to capital next after the Preference Shares.

The DEFERRED SHARES are then entitled to a Cumulative Dividend of 7 per cent. per annum.

Subject, as aforesaid, any profits which it may at any time be determined to distribute, and in a winding up, any surplus assets, after repayment of Capital, are to be divided as to one half among the holders of the Ordinary Shares, and as to the other half among the holders of the Deferred Shares.

Of the above Capital £226,225 in Preference Shares, £226,225 in Ordinary Shares, and £603,500 in Deferred Shares will be issued in part payment of the purchase money, and £14,600 in Preference Shares, £14,600 in Ordinary Shares, and £46,500 in Deferred Shares are reserved for future issue to enable certain contemplated arrangements to be completed.

The CAPITAL and COUNTIES BANK, Limited, at its Head Office, 39, Threadneedle Street, London, E.C., and all its Branches, is authorized to RECEIVE APPLICATIONS at par for 227,435 FIVE per CENT. CUMULATIVE PREFERENCE SHARES of £5 each, and 987,175 ORDINARY SHARES of £1 each, payable as follows:—

	Preference Shares.	Ordinary Shares.
On Application	£0 5 0 per Share	.. £0 1 0 per Share.
On Allotment	1 0 0 „	.. 0 4 0 „
On 31st January, 1898	3 15 0 „	.. 0 15 0 „
	£5 0 0	£1 0 0

All the Preference and Ordinary Shares will be converted into Stock, when and as fully paid.

DIRECTORS:

SIR HENRY BURDETT, K.C.B., Chairman, The Lodge, Porchester Square, W.
MAJOR-GENERAL GEORGE DE LA POER BERESFORD, Vice-Chairman.
ALFRED BETHELL.
LIEUT.-COLONEL W. TRESLOVE ELLIS.
JULIUS MOELLER.
FREDERICK DE LA FONTAINE WILLIAMS.
LESTER R. DE FONBLANQUE (Secretary of the Incandescent Gas-Light Company, Limited).

} Directors respectively of some or one of the Old Companies.

SOLICITORS TO THE COMPANY:
FRANCIS and JOHNSON, 26, Austin Friars, E.C.

BANKERS:
The CAPITAL and COUNTIES BANK, Limited, 39, Threadneedle Street, E.C. and Branches.

BROKERS:
W. GREENWELL AND CO., 2, Finch Lane, E.C.
LINTON, CLARKE, AND CO., Bartholomew House, E.C.

SOLICITORS TO THE VENDOR COMPANY:
GRUNDY, KERSHAW, SAXON, SAMSON, AND CO., 4, New Court, Lincoln's Inn, W.C.

AUDITORS:
DELOITTE, DEVER, GRIFFITHS, AND CO., 4, Lothbury, E.C.

SECRETARY (*pro tem.*) **AND REGISTERED OFFICE:**
G. A. GUTCH, 14, Palmer Street, Westminster, S.W.

PROSPECTUS.

This Company has been formed to purchase and consolidate the Businesses, Undertakings, and Properties of the Incandescent Gas-Light Company, Limited; the Austrian Incandescent Share Company, Limited; the Second Austrian Incandescent Share Company, Limited, and the Irish Incandescent Gas-Light Company, Limited, with the result that all these Companies, and also the English Incandescent Gas Share Company, Limited, will be dissolved, and for the other purposes contained in the Memorandum of Association.

By the consolidation certain onerous arrangements will be done away with, whereby large commissions, amounting for the last financial year to about £29,000, and paid for that year out of the profits earned in Vienna, will be saved. The cash working capital will also be largely increased.

The outcome of the amalgamation will be to give to the new Company, as the owner of the great bulk of the Shares in the Vienna Company, the control of its business, including the Factory, where the Lighting Fluid supplied under contract to the English, French, German, Austrian, Italian, and other Continental Markets, and India and Australasia is manufactured.

Every development in Incandescent Gas Lighting by the Welsbach System necessitates a continued increase in the output of fluid; and, as the profits on the manufacture are very considerable, it is the development of the Incandescent Gas-Light System generally that justifies the expectation of the profits to be derived from the fluid factory. England is one of the largest fields for the sale of the Incandescent Gas-Light Burners and Mantles; and the past development of the system in England and its future prospects, therefore, deserve the closest attention.

The immense popularity of the light is evidenced by the following figures supplied by the Incandescent Gas-Light Company, Limited, of their sales in Great Britain for the last four years.

Total Sales of the English Company.

	Burners complete with Mantles.	Renewal Mantles.
For the Year ending March 31, 1894	104,278	178,246
„ „ „ 1895	280,480	729,564
„ „ „ 1896	593,467	1,637,821
„ „ „ 1897	929,176	3,096,627
	1,907,401	5,642,258

Every complete Burner sold is not only a source of profit in itself, but constitutes a continuous source of income by reason of the profits derived from the sale of Mantles required to supply such Burner.

It is believed that in the United Kingdom there are over 200 million gas-jets in use; so that it will be seen that not 1 per cent. of the business that might be done has yet been reached. The recent introduction of the system for street-lighting, factories, railway stations, offices, workshops, &c., and large public institutions has met with a success which promises well for a great development in the future. Certain valuable patent rights, now in course of arrangement, will, it is considered, result in the Welsbach light presenting such additional advantages as will increase the popularity it has already secured.

In addition to this, an Oil-Lamp for use with Incandescent Mantles will shortly be placed on the market; thus bringing the advantages of the Welsbach system within the reach of districts where gas is not obtainable.

The books and accounts have been examined by Messrs. Deloitte, Dever, Griffiths, & Co., chartered accountants, who certify as follows:—

4, Lothbury, London, E.C., Nov. 29, 1897.

We have examined the accounts of the Incandescent Gas-Light Company, Limited (England), the Oesterreicheische Gasglühlicht Actiengesellschaft (Vienna), and the Irish Incandescent Gas-Light Company, Limited, for the last completed financial year of each Company. After providing for the expenses for one year of the three Share Companies (the English Incandescent Gas Share Company, Limited, the Austrian Incandescent Share Company, Limited, and the Second Austrian Incandescent Share Company, Limited, and for depreciation on the buildings, plant, and machinery at rates which appear to us reasonable, but before charging Directors' fees, Managers' commission, English income-tax, and interest on the £55,000 Debentures of the Incandescent Gas-Light Company, Limited, which are to be repaid, we certify that the net trading profits amounted to £209,808.

DELOITTE, DEVER, GRIFFITHS, & Co.,
Chartered Accountants.

The Company acquires by the present purchase 1257 Shares out of a total of 1500 Shares in the Vienna Company. When the outstanding 243 Shares have been acquired, for which capital is reserved, the Company will become entitled to the whole profits of the Vienna business.

The net trading profits shown by the above certificate were £209,808, whilst £169,500 only is required to pay the dividends shown below:

To pay the Dividend on the £1,500,000 Five per cent. Preference Shares will take.....	£75,000
To pay 7 per cent. on the £1,350,000 Ordinary Shares will take.....	£94,500
	£169,500

Apart from any new patent rights, as above mentioned, the Company will work under the Welsbach patents of 1885, 1886, and 1893, the latter of which does not expire until 1907. The great strength of the Company lies, however, in its commercial organization. It is in close touch with the leading Gas Companies, and with practically every town or village throughout the United Kingdom where there is gas.

During the past six years the Incandescent Gas-Light Company, Limited, has been organizing a system for the supply and maintenance of the Company's lamps and mantles in the principal towns of Great Britain; and there are at present some 1400 Agents, in addition to over 10,000 dealers, who are under agreement with the Company.

In view of the rapid development of street lighting by the Company's system, it is also important to note that the Company, with its perfectly equipped works and its thoroughly efficient plant, is in the position to deal with such lighting on the most extensive scale, and itself to manufacture all appliances and apparatus for the purpose.

The Welsbach Incandescent Gas-Light, as compared with the ordinary gas-burner, gives three times the amount of light with half the gas, while, as compared with electric light, it gives equal light at one-eighth the cost, and until electricity can be supplied at ½d. per unit, it cannot compete with the Welsbach with gas at 3s. per 1000 cubic feet.

Contracts securing their services for a term of years have been arranged with Mr. Julius Moeller, Mr. Fred. de la Fontaine Williams, and Mr. Lester R. de Fonblanque, to whose able management and policy the past development and success of the Welsbach Incandescent Gas Lighting in England has been largely due, and with Mr. William MacKean, Chief Chemist. Similar arrangements have been made with Mr. Ludwig Haitinger, Chief Chemist; Mr. Moritz Gallia, Manager; and Mr. Felix Kuschenitz, Secretary to the Vienna Company.

The amalgamation has been brought about by the Reconstruction Guarantee Company, Limited, who acquire the various businesses and have negotiated and effected the various agreements. The aggregate purchase price for the businesses and properties of the Incandescent Gas-Light Company, Limited, and the Irish Company, and the above-mentioned 1257 Shares in the Vienna Company, mostly held by the two Austrian Share Companies, and the benefit of the agreements included in the sale has been fixed by the Reconstruction Guarantee Company, Limited, who are the promoters, at £3,258,124, payable as to £226,225 in fully-paid Preference Shares, £226,225 in fully-paid Ordinary Shares, £603,500 in fully-paid Deferred Shares, and as to the balance in cash. Out of the purchase price, the Reconstruction Company provides £100,000 cash for additional working capital, and has to pay for the businesses, properties, and benefits of Contracts included in the sale, the sum of £2,793,124 as to £1,776,529 in cash, as to £226,225 in fully-paid Preference Shares, as to £226,225 in fully-paid Ordinary Shares, and as to £564,145 in fully-paid Deferred Shares. Included in the £2,793,124 is a sum of £200,000, representing the aggregate of sums payable for commutation of commissions, and in satisfaction of claims for loss of office by Directors, Secretaries, and employees of the old Companies, and for the Contracts securing continuity of service. The Reconstruction Company also pays all expenses in connection with the negotiations and all expenses of forming and registering this Company, and of carrying out the amalgamation down to allotment, excepting stamp duties and cost of conveyances, and also pays the cost of guaranteeing the subscription of the capital other than that issued as fully-paid, and the expenses of liquidating the English Companies and the Irish Company.

This Company undertakes the payment, with certain exceptions, of the liabilities existing on the various dates from which the sale takes effect, and is entitled to the accrued profits as from such dates making certain payments by way of interest to the old Companies from those dates to the incorporation of the Company.

In addition to the capital now offered for subscription, £244,000, one-half in Preference Shares and one-half in Ordinary Shares, have already been applied for by Directors and their friends.

The following contracts have been entered into, namely:—

(1).—Dated 1st November, 1897. Contract in the German language made between Moritz Gallia and the Reconstruction Guarantee Company, Limited. (2).—Dated 1st November, 1897. Contract in the German language made between Ludwig Haitinger and the Reconstruction Guarantee Company, Limited. (3).—Dated 2nd November, 1897. Contract in the German language made between Felix Kuschenitz and the Reconstruction Guarantee Company, Limited. (4).—Dated 3rd November, 1897. Contract in the German language made between the Reconstruction Guarantee Company, Limited, and Dr. Adolf Gallia. (5 to 9).—Dated 2nd November, 1897. Contracts made in the German language between the Reconstruction Guarantee Company, Limited, and the members of the Board of Directors of the Oesterreicheische Gasglühlicht Actiengeselschaft, by means of a written proposal addressed to the members of the said Board by the Reconstruction Guarantee Company, Limited, followed by a written acceptance of such proposal, signed by each member of such Board, Dr. Adolf Gallia, Dr. C. Von Feisumantel, Albert Laurans, Frederick de la Fontaine Williams, and Julius Moeller. (10).—Dated 2nd November, 1897. Contract, by means of cross letters in the German language, between the Reconstruction Guarantee Company, Limited, and Dr. Carl Auer Von Welsbach. (11).—Dated 10th November, 1897. Agreement made between the Incandescent Gas-Light Company, Limited, and the Reconstruction Guarantee Company, Limited. (12).—Dated 10th November, 1897. Agreement made between the Reconstruction Guarantee Company, Limited, the English Incandescent Gas Share Company, Limited, and the Incandescent Gas-Light Company, Limited. (13).—Dated 10th November, 1897. Agreement between Walter Treslove Ellis, on behalf of a Company then proposed to be and since incorporated as the Austrian Incandescent Share Company, Limited, and the Reconstruction Guarantee Company, Limited. (14).—Dated 10th November, 1897. Agreement made between the Second Austrian Incandescent Share Company, Limited, and the Reconstruction Guarantee Company, Limited. (15).—Dated 10th November, 1897. Agreement made between the Irish Incandescent Gas-Light Company, Limited, and the Reconstruction Guarantee Company, Limited. (16).—Dated 10th November, 1897. Agreement made between the Reconstruction Guarantee Company, Limited, and Major-General George de la Poer Beresford and William Harris. (17).—Dated 10th November, 1897. Agreement made between Julius Moeller and the Reconstruction Guarantee Company, Limited. (18).—Dated 10th November, 1897. Agreement made between Frederick de la Fontaine Williams and the Reconstruction Guarantee Company, Limited. (19).—Dated 10th November, 1897. Agreement made between Lester Ramsay de Fonblanque and the Reconstruction Guarantee Company, Limited. (20).—Dated 4th December, 1897. Agreement made between William MacKean and the Reconstruction Guarantee Company, Limited. (21).—Dated 8th December, 1897. An adoptive deed made between the Austrian Incandescent Share Company, Limited (Reconstructed Company), the Reconstruction Guarantee Company, Limited, and Walter Treslove Ellis. (22).—Dated 10th December, 1897. Agreement made between this Company and Julius Moeller. (23).—Dated 10th December, 1897. Agreement made between this Company and Frederick de la Fontaine Williams. (24).—Dated 10th December, 1897. Agreement made between this Company and Lester Ramsay de Fonblanque. (25).—Dated 10th December, 1897, made between this Company and Sir Henry C. Burdett. (26).—Dated 10th December, 1897. Agreement made between this Company and William MacKean. (27).—Contract, being the re-sale Agreement, dated 10th December, 1897, between the Reconstruction Guarantee Company, Limited, and this Company. (28 and 29).—Two Agreements, dated respectively 10th December, 1897, between the Reconstruction Guarantee Company, Limited, and Messrs. Linton, Clarke, and Co., guaranteeing the subscription of part of the Ordinary and Preference Share Capital of the Company.

In addition to the above, there are various trade and other Contracts connected with the business, and Contracts and Arrangements in relation to the formation of the Company and the issue of its Capital and the satisfaction of the various expenses and outgoings payable by the Reconstruction Company. Subscribers will be held to have notice of these Contracts and Arrangements, and to have agreed with the Company as Trustees for the Directors and other persons liable, to have waived, and shall waive such claims (if any) as they have or may have against them under Section 38 of the Companies' Act, 1867, or otherwise with reference thereto, and Allotments will only be made on this footing.

The above specifically mentioned Contracts, the certificate of Messrs. Deloitte, Dever, Griffiths, and Co., and a copy of the Memorandum and Articles of Association may be inspected at the Offices of the Company's Solicitors.

Application will be made in due course to the Committee of the Stock Exchange for a special settlement and official quotation.

Applications for Shares should be made on the form accompanying the Prospectus, and forwarded, with the amount due on application, to the Capital and Counties Bank, 39, Threadneedle Street, London, E.C., or to any Branch of the Bank.

If no allotment is made, the deposit will be returned in full; and where a smaller allotment is made than is applied for, the balance of the deposit will be applied towards the amount due on allotment. Failure to pay any instalment when due renders all previous payments liable to forfeiture.

Prospectuses and Forms of Application may be obtained at the Offices of the Company, and from the Bankers, Brokers, and Solicitors.

London, Dec. 11, 1897.

SITUATION wanted, by a steady competent Man, of considerable Experience, to TAKE CHARGE of Small Works, or would take Situation as RETORT-HOUSE FOREMAN in large Works.

Address No. 2975, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

TWO Jointers wanted, to lay 4 miles of 6, 4, and 3 inch MAIN. To commence Dec. 27.

Apply, stating Qualifications, References, and Wages required, to Manager, Gas-Works, Whitchurch, Hants.

WANTED, a Mechanical Draughtsman, well up in General Engineering details, and accustomed to Gas-Works Plant.

Apply, stating Experience, Age, and Wages required, to No. 2974, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

PUPIL.

THE Engineer of a large Provincial Gas Company has a vacancy for a PUPIL. Premium required.

Address No. 2972, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

RHONDDA URBAN DISTRICT COUNCIL.

APPOINTMENT OF GAS AND WATER WORKS MANAGER.

THE Rhondda Urban District Council invite APPLICATIONS for the appointment of MANAGER of Gas and Water Works.

The quantity of Gas sold is about 60 million cubic feet per annum; and the Water is supplied to about 50,000 persons.

Salary £350 per annum, with House, Coal, Gas, and Water free.

Applicants must have had considerable experience in both Gas and Water.

Applications, stating Age and Experience, with *copies* of not more than three recent Testimonials, to be sent to me the undersigned on or before Wednesday, the 22nd inst.

Walter H. Morgan,
Clerk.

Treforest, Glam.,
Dec. 4, 1897.

GAS CARBON Wanted, not less than 4-Ton Loads.

Apply to the Brimington Carbon Company, Sowerby Bridge, Yorks.

WANTED Carbon. State Price for 4-ton Lots, delivered at nearest Station.

Address No. 2960, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, a Gasholder (Single Lift), capacity 10,000 to 12,000 Cubic Feet. Second Hand.

Send full Particulars, and state where Holder can be inspected, to the Manager, Gas-Works, Wadebridge, Cornwall.

SULPHURIC Acid for Sale B.O.V. and R.O.V. made from Sulphur. Inquiries solicited.

J. Hardman, Chemical Works, Milton and Tunstall, Staffs.

FOR SALE—300 14-in. Street-Lanterns, with Cradles, in good condition. Reasonable offers will be considered.

Apply to the Engineer and Manager, Brentford Gas Company, High Street, Brentford.

GAS-PUMP for Sale, horizontal, one Steam Cylinder, 18-inch bore, and two Gas Cylinders, 17½-inch bore, all 24-inch Stroke, on massive Bed-Plate, with heavy Fly-Wheels. Very strong. First-Class Make. Not much used.

Apply, by letter, to No. 2878, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

FOR SALE—A Modern Sulphate of AMMONIA STILL, built by Messrs. R. & J. Dempster, Manchester, 1893, with separate Liming Compartment. Capacity, with ordinary Liquor, 5000 to 6000 lbs. of Sulphate per day.

For further Particulars, apply to the Brymbo Steel Company, Limited, near Wrexham.

DISUSED Plant for Sale—viz., 500,000 Cubic Feet WALKER'S PATENT PURIFYING MACHINE; Eight PURIFIERS, 12 ft. Square; 250,000 Cubic Feet KIRKHAM, HULETT, and CHANDLER'S WASHER-SCRUBBER; MANN and WALKER'S TOWER SCRUBBER, 5 ft. by 38 ft.

Apply to the Gas-Works, Harrogate.

FOR SALE—A 6000 Cubic Feet per hour STATION METER, in Cast-Iron Cylindrical Case (8-inch Connections). Equal to new. Made by Messrs. Parkinson and Co. Bye-pass Valves, &c., if required.

Apply to Vincent Hughes, Manager, &c., Gas-Works, Tipton.

BARRHEAD GASLIGHT COMPANY, LIMITED.

FOR SALE—Four Purifiers: Two 12 ft. by 6 ft.; one, 11 ft. by 8 ft.; and one 12 ft. by 8 ft., with 8-inch Connections, Valves, and Lifting Apparatus, complete. Very suitable for a small Works.

Can be seen on application to the Manager, Gas-Works, Barrhead.

THE Oxford Gaslight and Coke Company will have FOR DISPOSAL in 1898 a Set of Four PURIFIERS, 26 ft. by 22 ft. by 5 ft. deep, with Cockey's Centre-Valve and 18-inch Connections and Lifting Apparatus complete. Also a Set of Four PURIFIERS, 20 ft. by 20 ft. by 5 ft. deep, with Six Cockey's Four-Way Valves and 15-inch Connections and Lifting Apparatus complete. One Set will be ready for removal in April, and the other in August next. The IRON ROOFS, with Columns for both Sets, can be purchased if required. They also offer Twelve unusually strong ROOF PRINCIPALS, 50 feet span.

The whole can be seen at the Gas-Works, Oxford.

By order of the Board,
James Eldridge,
Engineer.

HAWORTH URBAN DISTRICT COUNCIL.

TENDERS are invited for the purchase of the Council's surplus TAR and LIQUOR for the Year ending Dec. 31, 1898, delivered on Rails at Haworth Station.

Tenders to be sent to me not later than Dec. 29.

William Robertshaw,
Clerk to the Council.

Burlington Chambers, Keighley.

TENDERS FOR TAR.

THE Directors of the Exeter Gaslight and Coke Company invite TENDERS for their surplus TAR for Six Months from the 1st of January next.

Delivery on Company's Works, filled into Purchaser's Tanks.

Sealed tenders, endorsed "Tender for Tar," will be received by the undersigned on or before Friday, the 17th of December next; but the Directors do not bind themselves to accept the highest or any tender.

By order,
W. A. Padfield,
Engineer and Secretary.

CORPORATION OF BURY.

TO RETORT AND FIRE-BRICK MANUFACTURERS.

THE Corporation of Bury are prepared to receive TENDERS for RETORTS, FIRE-BRICKS, and FIRE-CLAY required at their Gas-Works.

Forms of Tender may be obtained from Mr. W. H. S. Gendall, Gas Engineer, Gas-Works, Elton, Bury.

Tenders, sealed and endorsed "Tender for Retorts," &c., to be sent to me not later than Monday, the 20th day of December, 1897.

John Haslam,
Town Clerk.

Bury, Dec. 2, 1897.

THE Directors of the Worksop Gas Company invite TENDERS for the purchase of the surplus TAR and the AMMONIACAL LIQUOR made at their Works from the 1st of January to the 31st of December, 1898.

Tenders for Tar to state price per ton, delivered into Purchaser's Tanks, at the Worksop Railway Station.

Tenders for Liquor to state price per ton, as tested by Twaddel's No. 1 Hydrometer, delivered into Boats near the Company's Works, or price per ton, delivered into Purchaser's Tanks, at the Railway Station.

The Directors do not bind themselves to accept the highest, or any tender.

Tenders to be sent in by the 30th of December.

Worksop, Dec. 11, 1897.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

THE Directors of the above Company are prepared to receive TENDERS from Ironfounders, Gun-Barrel Manufacturers, Timber Merchants, Druggists, Ropemakers, &c., for GOODS to be delivered on the Company's Works, Great Brunswick Street, in such quantities as may be required from time to time up to the 31st of December, 1898.

Samples of Goods required are open to inspection on the Works, Great Brunswick Street, and printed lists of Articles required can be had on application at the Company's Offices, D'Olier Street.

Tenders, endorsed "Tenders for Stores," to be lodged in my Office on or before the 21st inst.

W. F. Cotton,
Secretary and Manager.

D'Olier Street, Dublin,
Dec. 7, 1897.

ROCHDALE CORPORATION.

TO RETORT MAKERS AND OTHERS.

THE Gas Committee of the above Cor- poration invite TENDERS for the supply of such quantities of RETORTS and other FIRE-CLAY GOODS as may be required during the Year ending the 31st of December, 1898.

Forms of Tender and any further Information may be obtained on application to Mr. T. Banbury Ball, the Manager at the Gas-Works.

Tenders, endorsed "Fire-Clay Goods," must be sent to me not later than noon on Wednesday, the 22nd of December, 1897.

Contractors who intend to sub-let part of their contracts must forward with their original tenders a list of the Names of their Sub-Contractors.

By order,
James Leach,
Town Clerk.

Town Hall, Rochdale,
Dec. 9, 1897.

HORNSEY GAS COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS of this Company, so far as they relate to DEBENTURE STOCK only, WILL BE CLOSED on the 18th inst., and RE-OPENED on the 1st prox.

S. J. WILLIAMS,
Secretary.

63, Chancery Lane,
Dec. 10, 1897.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS of this Company so far as they relate to DEBENTURE STOCK WILL BE CLOSED at Ten o'clock forenoon on Friday, the 10th inst., for the Half Year to Dec. 31, 1897, and will be RE-OPENED on Thursday, the 16th inst.

The Interest for the Half Year will be payable on the 1st of January next to the Proprietors registered on the closing of the Books.

By order of the Board,
JAMES RANDALL,
Secretary.

Gas Offices: Willoughby Lane,
Tottenham, Dec. 3, 1897.

ISSUE OF STOCKS AND SHARES BY AUCTION UNDER PARLIAMENTARY POWERS.

MR. ALFRED RICHARDS undertakes the issuing by Auction of GAS AND WATER SHARES under Parliamentary Power.

He also holds MONTHLY SALES of GAS AND WATER SHARES at the Auction Mart, Tokenhouse Yard, E.C.

Terms for the issuing of Capital, and also for offering to auction Gas and Water Shares, and all Particulars relating thereto, may be had of Mr. Alfred Richards.

Offices: 18, FINSBURY CIRCUS, E.C.

Price 7s. 6d., Demy 4to., Limp Cloth.

THE FLOW OF GASES
AND PROPORTIONING GAS-MAINS
FOUR DIAGRAMS

(WITH EXPLANATORY PAMPHLET)

Invented by F. S. CRIPPS, Assoc.M.Inst C.E.

LONDON:
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

PRICE'S COKE & COAL BARROW

effects a great saving of time, labour, and expense.

For Particulars, Price, &c., apply to Mr. EDWARD PRICE, 119, Queen's Road, FINSBURY PARK, N.

Prices are Reduced.

LONDONDERRY GAS COALS

FROM THE

MARQUIS OF LONDONDERRY'S COLLIERIES.

COUNTY OF DURHAM.

Available output up to 5000 tons per day. Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO

S. J. DITCHFIELD,
SEAHAM HARBOUR, COUNTY OF DURHAM.

JAMES OAKES & Co.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1¼ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts and covers, and rendering leakage impossible.

GAS PURIFICATION BY
HYDRATED OXIDE.

THIS Material is of full Strength, and Exceptional Activity. It is specially prepared to minimize Back-Pressure; and will be supplied on Hire, or Sold, on the most favourable Terms.

SPENT OXIDES containing Blue, also CRUDE FERRO-CYANIDE PRODUCTS, either PURCHASED or EXCHANGED for FRESH OXIDE.

MANCHESTER OXIDE COMPANY, LTD.,
CANAL ST., MILES PLATTING, MANCHESTER.

E. ASQUITH & CO.,
Hydraulic Engineers,
17, Mather Street, Ancoats, Manchester,
Fit up Plants for
Pressing Anthracene, Naphthalene, &c.
Competent Men sent out to erect same. Estimates given.

GAS—NO MORE MANTLES.

BILLING'S NON-MANTLE INCANDESCENT GAS-BURNER. Perfect Light and Cheapness combined. 5s. 6d. Complete; Postage, 6d. extra. Lasts a Lifetime. Can be fixed to any existing Gas-Fittings. Gas-Fitters invited to see it; and Agents required.

Offices, where Samples can be seen (ROOM K),
17, GREAT TITCHFIELD STREET, W.

COKE-BREAKERS,
PRICES REDUCED.
(THOMAS & SOMERVILLE'S PATENT)
New Design, with two Cutting Rollers, making less Breese than their old pattern.

GEORGE WALLER & CO.,
165, QUEEN VICTORIA STREET, E.C.,
And at STROUD, GLOUCESTERSHIRE.

THE
"ETNA" FIRE & HEAT RESISTING
CEMENT,
For RETORT PURPOSES, is INVALUABLE.
Sole Manufacturers:
FRED VERITY & SON,
CALL LANE, LEEDS.
Scores of Testimonials received. Write for Particulars.

HEATHCOTE GAS COAL.

Rich in Illuminating Power and Yield of Gas. Above the Average in Weight and Quality of Coke.

Maintains a High Standard in Residuals.

THE GRASSMOOR CO., LD.,
CHESTERFIELD.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD
BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

ARMSTRONG'S
PATENT
CANDLE SAFETY LAMPS

Are a great improvement on Oil, giving a good Light, requiring little or no Cleaning, and when once lighted no further attention is necessary. The Candles are made to burn 5, 7, or 9 hours.

43, MANCHESTER STREET, GRAY'S INN ROAD, W.C.

HEBBURN MAIN GAS COALS.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.

For Prices, f.o.b. Ship or Delivered by Rail, apply to

THE WALLSEND & HEBBURN COAL COMPANY, LTD.,
8 Lombard Street,
NEWCASTLE-ON-TYNE.
W. RICHARDSON, Fitter.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

Telephone: Castleford No. 214. | Postal Address: Castleford.
Telegrams: "Silkstone Castleford."

THE SILKSTONE & HAIGH MOOR COLLIERIES, LTD.

ALLERTON BYWATER, CASTLEFORD.

Steam, Manufacturing, & Gas Coals & Cannel.

Analysis, Contracts, Trial Waggons, and Quotations Large and Small Orders. Inquiries Solicited.

THOMAS TURTON
AND SONS, LIMITED,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.

LONDON OFFICE:
90, CANNON STREET, E.C.

Lanemark Coal Co.,
LIMITED.

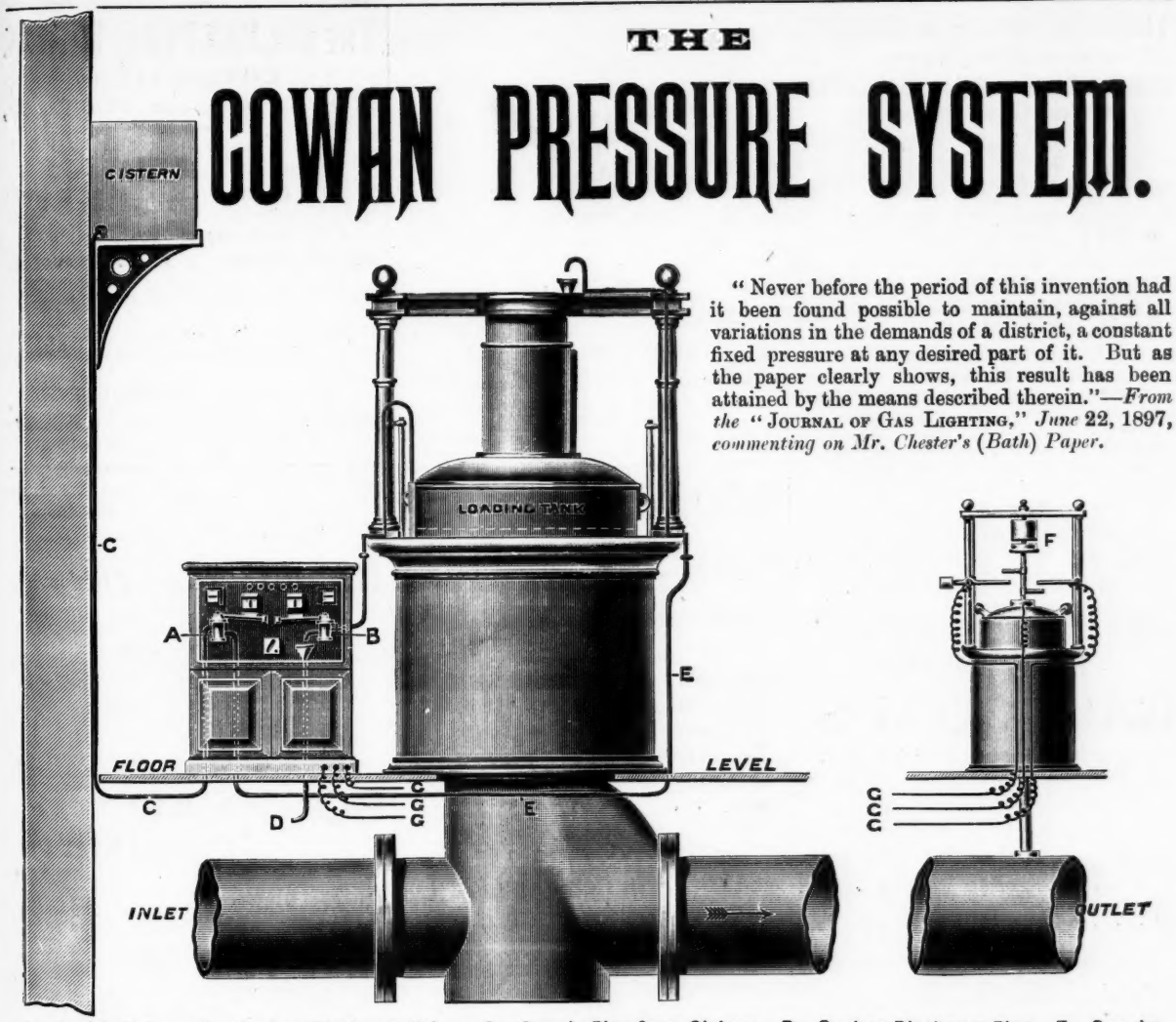
LANEMARK CANNEL
AND GAS COALS.

Quotations and Analysis on Application to

LANEMARK COLLIERY,
NEW CUMNOCK, N.B.

Shipping Ports: All the principal Scotch Ports.

THE COWAN PRESSURE SYSTEM.



A.—Supply Valve. B.—Syphon Discharge Valve. C.—Supply Pipe from Cistern. D.—Syphon Discharge Pipe. E.—Supply Pipe to Governor. F.—Suspended Weights. G.—Electric Circuit for Operating Valves A and B.

"Never before the period of this invention had it been found possible to maintain, against all variations in the demands of a district, a constant fixed pressure at any desired part of it. But as the paper clearly shows, this result has been attained by the means described therein."—*From the* "JOURNAL OF GAS LIGHTING," *June* 22, 1897, *commenting on Mr. Chester's* (*Bath*) *Paper.*

Extracts from a Paper read at Bath, in June, 1897, by W. R. CHESTER, Esq., M.Inst.C.E., Gas Engineer to the Corporation of Nottingham.

"The instrument acts with perfect regularity whatever the draft on the mains may be, and responds to every change in the demand with absolute precision. . . . It is immaterial whether the demand be temporary, such as is due to a passing cloud in the daytime, whether it is sudden, or whether it comes on gradually, as when one burner after another is lighted up, the Governor is always equal to the occasion, and performs its function with automatic precision, never allowing more pressure in the district than is required, and never permitting an insufficient supply of gas, so long as the gasholder pressure behind the Governor is in excess of that needed to maintain the standard at the far end during periods of maximum demand. . . . Whatever the saving in leakage may be, whether much or little, and it must be one or the other, this is only one incident in the favourable working of the apparatus—a far more important one being, in the opinion of the writer, the guarantee that, under all circumstances and at all times, the consumer will get a sufficient quantity of gas, whether his requirements are great or small, and that the supplier of gas will never be called upon to deliver it except under the most advantageous conditions to himself."

Letter from C. B. NEWTON, Esq., Assoc.M.Inst.C.E., Gas Engineer to the Corporation of Carlisle.

The Gas-Works, Carlisle,
Feb. 3, 1897.

W. COWAN, Esq.

DEAR SIR,—I have pleasure in stating that your AUTOMATIC PRESSURE SYSTEM, which has been in constant use here for more than two years, continues to give every satisfaction. It controls the pressure of the gas supplied to a low-lying and extensive district, and has proved to be most reliable in its action.

This apparatus is a valuable aid to the economical distribution of gas owing to the way the pressure is put on and taken off. It is not put on until the consumption demands a greater supply; and immediately the draught in the mains is reduced, the Governor is automatically adjusted to pass the exact quantity of gas required.

By no human agency can the Governors be loaded and unloaded to meet the constant variations due to atmospheric conditions, and the requirements of consumers, without giving either a pressure in excess of that which is necessary, or at times failing to give a sufficient supply; but your apparatus responds instantly and effectually to the call of the consumer.

I shall be pleased to show the apparatus, or give any information to those interested.

Yours faithfully,
(Signed) C. B. NEWTON, Assoc.M.Inst.C.E.

For Particulars, Apply to

W. & B. COWAN, LTD.

— ESTABLISHED 1827 —

SMITH SQUARE WORKS, WESTMINSTER. **LONDON, S.W.**

DALTON STREET WORKS, NEWTOWN, **MANCHESTER.**

BUCCLEUCH STREET WORKS, **EDINBURGH.**

COLONIAL METER WORKS, MACQUARIE PLACE, **SYDNEY, N.S.W.**

TROTTER, HAINES, & CORBETT,

Brettell's Estate

FIRE-CLAY & BRICK WORKS,

STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

Proprietors of

BEST GLASSHOUSE POT & CRUCIBLE CLAY.

Shipments Promptly and Carefully Executed.

London Office: R. Cull, 84, Old Broad St., E.C.

BOLDON GAS COALS.

ANALYSIS.

Yield of Gas per ton .	10,500	Cubic Feet.
Illuminating Power . .	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

For Prices, &c., apply to

W. H. PARKINSON,

THE HARTON COAL CO., LTD.,

NEWCASTLE-ON-TYNE.

Telegraphic Address: "PARKINSON NEWCASTLE."

HOLMSIDE

GAS COALS.

Present Daily Produce over 5000 Tons.

Latest Analysis—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation

Yield of Gas per Ton . . . 11,205 Cubic Feet.
Illuminating Power $16\frac{7}{10}$ Stand. Sperm. Candl.
Coke (of good & pure quality) $13\frac{3}{4}$ Cwt. per Ton.
Sulphur . . . . . A little over 1 per Cent.
Ash . . . . . Under 1 per Cent.
Tar . . . . . 163 lbs. (Avoir.) per Ton.
Ammoniacal Liquor 103 lbs. (Avoir.) per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England, and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR

PELTON GAS COALS.

Present Daily Produce available 3000 Tons.

Of equal quality to the "Holmside" Coal, and also very largely used by many Gas Companies at Home and Abroad.

Both descriptions are shipped at Tyne Docks, and Dunston Staiths, River Tyne, also at North and South Docks, Sunderland.

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,

HOLMSIDE & SOUTH MOOR OFFICES,

NEWCASTLE-UPON-TYNE.

EVESON FOR CANNEL

Telegrams:

"EVESON, BIRMINGHAM."

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on Application.

THORNLEY GAS COALS

WORKED BY THE

WEARDALE IRON & COAL Co., Ld.

OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by

Messrs. J. & H. S. PATTINSON, *May 28, 1895.*

Yield of Gas per Ton .	10,500 Cub. Ft.
Illuminating Power .	16·9 Candles.
Coke (of good quality) .	67·5 per Cent.
Sulphur	0·58 ,,
Ash	2·73 ,,

For Price, &c., apply to the

WEARDALE IRON & COAL Co., Ld.

QUAYSIDE, NEWCASTLE-ON-TYNE.

BOGHEAD CANNEL

OR

TORBANEHILL MINERAL.

JAMES WOOD, LTD.,

Are the only Producers of the famous original

BOGHEAD CANNEL or

TORBANEHILL MINERAL.

F.o.b. or c.i.f. Prices on Application to

28, ROYAL EXCHANGE SQUARE,

GLASGOW.

THE SILICA FIRE-BRICK

COMPANY,

OUGHTIBRIDGE, near SHEFFIELD,

MANUFACTURE

SILICA BLOCKS, BRICKS, AND CEMENT

OF SUPERIOR QUALITY

FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their

GREATER DURABILITY,

Strongly recommended where EXCESSIVE HEATS have to be maintained.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.

TYNE

BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub.
Illuminating Power	17·8 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to

THOS. W. DANCE & SONS,

Coal Owners, Newcastle-on-Tyne;

OR

E. FOSTER & CO.,

21, John Street, Adelphi, London, W.C.

MOBBERLEY & PERRY

STOURBRIDGE.

Manufacture & supply best quality of

Gas Retorts (SEGMENTAL, HORIZONTAL, or INCLINED.)

Special Bricks & Blocks for GENERATOR & REGENERATOR FURNACES.

FIRE BRICKS, LUMPS, & TILES, BLUE STAFFORDSHIRE VITRIFIED BRICKS FOR PAVING, &c., &c.

EVERY REQUISITE FOR GAS-WORKS. Retort Setters sent to any part of the Kingdom.

London Agents: Contractors for the erection of Retort-Benches complete.

BALE & HARDY, Gas Engineers and Contractors, BRIDGE HOUSE, 181, QUEEN VICTORIA STREET, E.C.

HARRIS & PEARSON,

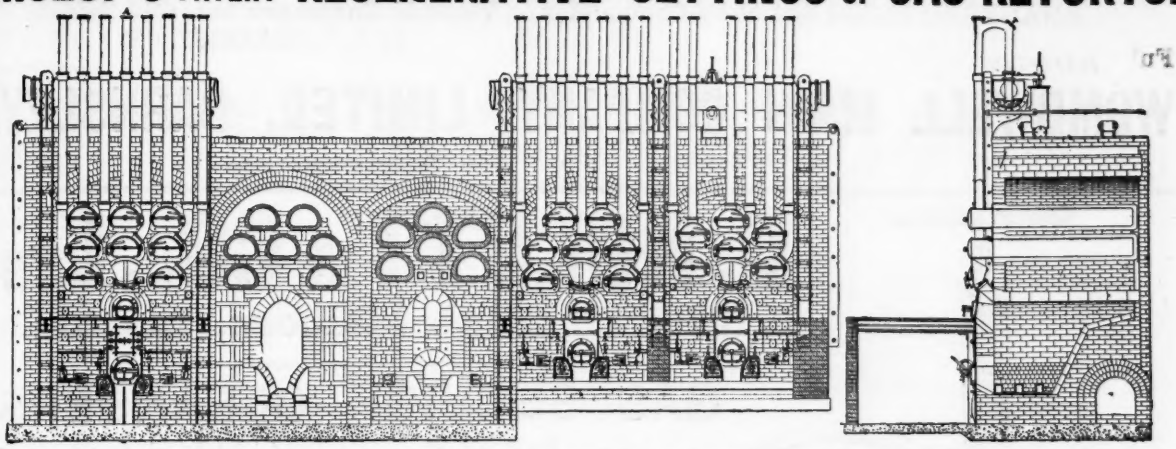
STOURBRIDGE, ENGLAND,

MANUFACTURERS OF

FIRE-CLAY GAS-RETORTS, FIRE-BRICKS, LUMPS, & TILES of Every Description.

GLAZED BRICKS AND PORCELAIN BATHS.

HISLOP'S PATENT REGENERATIVE SETTINGS OF GAS-RETORTS.



THESE SETTINGS ARE POSITIVELY UNRIVALLED IN PRODUCTIVE CAPACITY, DURABILITY, AND SIMPLICITY OF MANAGEMENT. RETORTS OF ORDINARY DIMENSIONS CARBONIZING FROM 17 TO 20 CWT. OF ENGLISH AND 20 TO 24 CWT. OF SCOTCH COAL PER 24 HOURS, DEPENDING UPON THE NATURE OF THE COAL, AND PRODUCING UP TO FULLY 13,000 CUBIC FEET PER MOUTHPIECE IN THE SAME TIME, AND WITH THE SMALLEST EXPENDITURE OF FUEL ATTAINABLE, AND RETURNING IN PROFIT THE ENTIRE COST OF ERECTION WITHIN TWELVE TO EIGHTEEN MONTHS; AND THUS REDUCING TO INSIGNIFICANCE THE INCREASED COST OF THESE SETTINGS OVER THE COMMON OR GENERATOR FURNACE SYSTEMS.

THESE SETTINGS ARE EXTENSIVELY ADOPTED, AND ARE ERECTED UPON THE SHALLOW AND STAGE FLOOR PLANS. THEY ARE ADAPTED TO ANY EXISTING ARRANGEMENTS, AND PERFECT SATISFACTION GUARANTEED. THE COMPOSITION OF FIRE-RESISTING AND OTHER SPECIAL FIRE-CLAY MATERIALS FURNISHED IS OF THE HIGHEST ORDER; AND THE SYSTEM AS A WHOLE, AS NOW PERFECTED, IS THE RESULT OF LONG EXPERIENCE AND CAREFUL STUDY OF THE PRINCIPLES OF GASEOUS FIRING.

Drawings and Tenders are furnished for the complete erection of Benches, including Retort and Bench Mounting of the most modern and approved description; or existing Ovens fitted up with the Patentee's arrangements.

Agents: **Messrs. JONAS DRAKE AND SON**, Retort Setters and General Carbonizing Engineers, Ovenden, Halifax, Yorkshire, Sole Agents for England, Wales, and Foreign Countries; **C. M. HAMILTON**, Retort Setter and Contractor, Hamilton, Agent for Scotland and Ireland; Principal Agent, **R. F. HISLOP** (Son of Patentee), General Constructing and Carbonizing Engineer, Gas-Works, Paisley, N.B., and to whom all Inquiries should be addressed in the first instance.

HISLOP'S PATENT HYDRAULIC MAIN SEAL-REGULATING AND TAR-EXTRACTING VALVE is a *Sine qua non*

TO THE SATISFACTORY WORKING OF THE HYDRAULIC MAIN UNDER THE REGENERATIVE AS WELL AS OTHER SYSTEMS OF RETORTS. BEING LARGELY ADOPTED AND AFFORDING THE HIGHEST SATISFACTION.

The Patentee's SELF-SEALING CAPS FOR THE TOP OF ASCENSION-PIPES, and his "SPECIAL" FLUE PORT BOXES, are most important additions to his Carbonizing Plant.

SPENT LIMES NO LONGER WASTE PRODUCTS.

Under G. R. HISLOP'S Patents, all Spent Limes are effectively recovered at from one-third to one-half the cost of New Lime.
Further Information and Pamphlets from Principal Agent.

LONDON OFFICE
60 QUEEN VICTORIA ST. E.C.

TELEGRAPHIC ADDRESSES
"DRAKESON HALIFAX."
"ECLAIRAGE LONDON."

TELEPHONE No. 43.
"HALIFAX EXCHANGE"

GAS ENGINEERS. CONTRACTORS. IRONFOUNDERS.

RETORT SETTERS. FURNACE BUILDERS. ETC. ETC.

JONAS DRAKE & SON

SOLE AGENTS FOR
HISLOP'S
PATENT REGENERATIVE FURNACES
— FOR —
ENGLAND, WALES & ABROAD.

RETORT BENCHES ERECTED COMPLETE WITH OR WITHOUT SPECIAL FURNACES. RESULTS GUARANTEED.

OVENDEN HALIFAX

Designs and Estimates on Application.

GASEOUS FIRING A SPECIALTY.

WOMBWELL MAIN COMPANY, LD.,
BARNSLEY.

BEST GAS COAL.

ANALYSIS: 11,390 feet of 17-Candle Gas. Value in Sperm per ton, 686 lbs.
By R. O. PATERSON, C.E.

APPLY

WOMBWELL MAIN COMPANY, LIMITED, BARNSLEY.

Telegrams: "MAIN, WOMBWELL."

D. HULETT & CO., LTD.
55 & 56, High Holborn, London.

GAS SERVICE CLEANSERS.
LAMP TORCHES.

DRY GAS-METER MAKERS.

WROUGHT-IRON TUBES & FITTINGS.
STREET LAMPS & POSTS.

PRICE LISTS ON APPLICATION.

OIL FOR GAS MAKING
PURE DISTILLATE.

HOMOGENEOUS IN CHARACTER.

NO MIXTURE.

CAN BE STORED SAFELY ANYWHERE.

FLASH POINT GUARANTEED OVER 200° FAHR.

(ABEL'S CLOSED TEST.)

ANGLO-CAUCASIAN OIL COMPANY, LTD.

18 & 19, GT. ST. HELEN'S, LONDON.

INDIA BUILDINGS, CROSS ST., MANCHESTER.

W. J. JENKINS & CO., RETFORD.

COAL UNLOADING

AND

CONVEYING MACHINERY.

COLUMNLESS GASHOLDERS

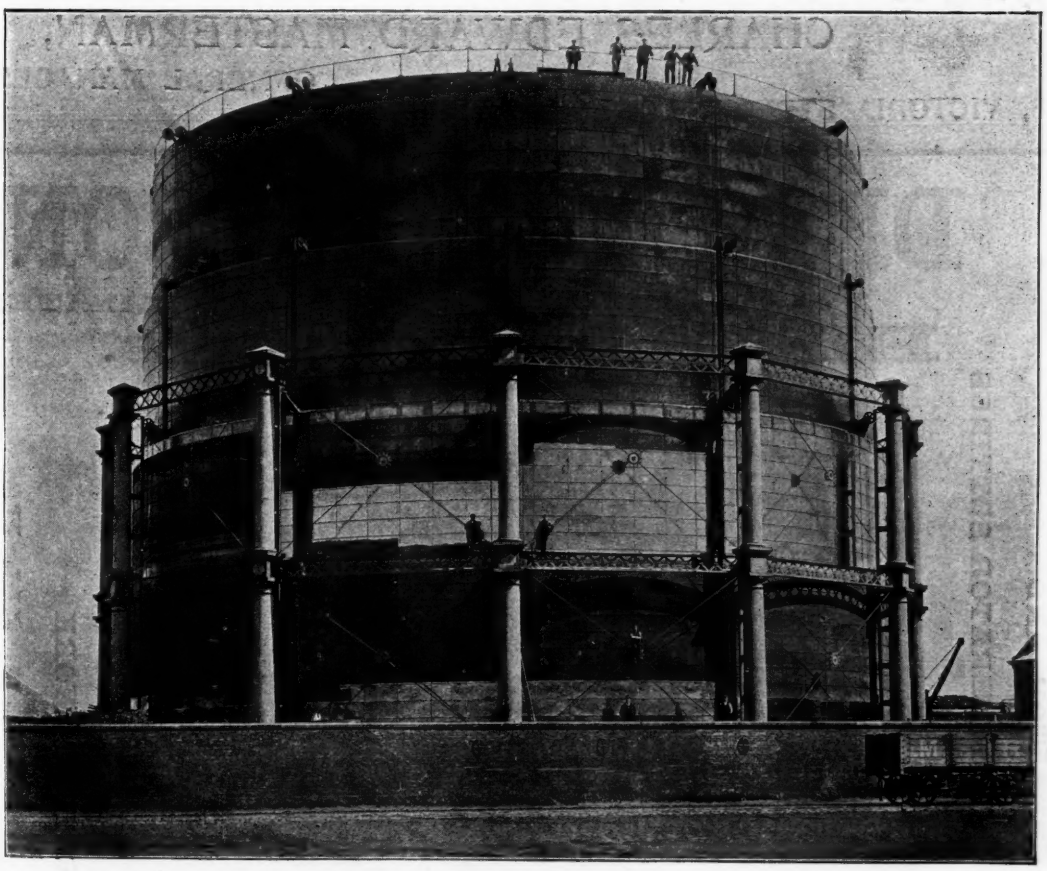
ON

PEASE'S STEEL CABLE SYSTEM.

Great Saving in Cost, and Absolutely Reliable in Working.

These Holders are certified by users to be STEADIER UNDER WIND PRESSURE than Holders with Columns.

INSPECTION INVITED. GREAT SAVING IN WEIGHT; FREIGHTS REDUCED.



FOUR-LIFT GASHOLDER, 120 Feet Diameter, 90 Feet High. TWO LIFTS ADDED ON STEEL CABLES (PEASE'S SYSTEM).
(CABLES ON THREE LIFTS)
WALLASEY URBAN DISTRICT COUNCIL.
(From a Photograph.)

Manufacturers and Patentees, Telegrams: "GASHOLDER."

ASHMORE, BENSON, PEASE, & CO., LIMITED,

STOCKTON-ON-TEES.

THE

DENAYROUZE LIGHT SYNDICATE, LTD.,

BEG to announce that, having made arrangements for the Manufacture of their **BURNERS** in England, they are **NOW ABLE TO SUPPLY THESE IN ANY QUANTITY.**

These Burners (with Mantles specially made for the Syndicate by the Incandescent Gas-Light Company, Ltd., under the Welsbach Patents) are admitted by all Experts to be the **BEST AND MOST ECONOMICAL LIGHTS FOR LARGE AREAS AND PUBLIC STREETS.**

Press Notices and Opinions from all the leading Gas Managers throughout the Kingdom can be seen on applying to

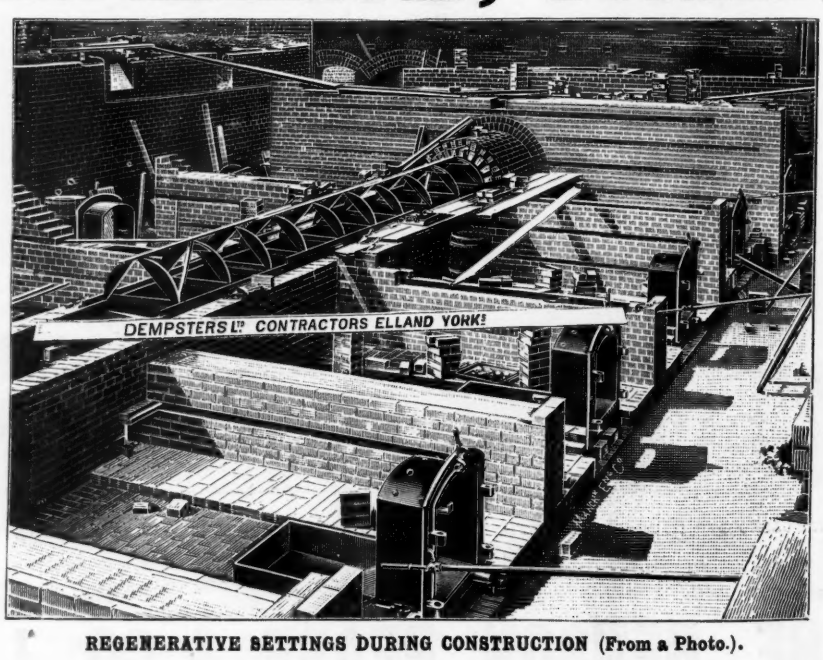
CHARLES EDWARD MASTERMAN,
GENERAL MANAGER.

28, VICTORIA STREET, LONDON, S.W.

R. DEMPSTER & SONS,
LIMITED.

ELLAND, YORKS.

DIRECT-FIRED GENERATOR AND REGENERATOR SETTINGS



AND RETORT WORK IN ALL ITS BRANCHES.

REGENERATIVE SETTINGS DURING CONSTRUCTION (From a Photo.).

CONTRACTORS FOR COMPLETE INSTALLATIONS ON HORIZONTAL OR INCLINED SYSTEMS, WITHOUT SUB-CONTRACTING.

TELEGRAMS: "FIRECLAY," LEEDS.

TELEPHONE No. 612.

COAL and COKE
Breakers, Elevators,
AND
Conveyors.

RETORTS,
Bricks, Blocks, Tiles,
&c.

ENGINEERS IRONFOUNDERS
EVERY
DESCRIPTION OF
RETORT SETTINGS
AND
IRONWORK.
WE GUARANTEE
RESULTS.
CONTRACTORS MANUFACTURERS

BUILDINGS,
ROOFS.

RE-SETTING
RETORTS.

We desire to call attention to our SHALLOW REGENERATIVE SETTINGS, which are comparatively inexpensive to erect, and productive of excellent results. They are specially designed to suit those Retort Houses where for various reasons it is undesirable to excavate to any great depth.

We shall be pleased to furnish Designs and Estimates on application.

THE LEEDS FIRECLAY CO. LTD., ENGINEERING DEPARTMENT, WORTLEY, nr. LEEDS.

THE "TRAFALGAR."

PREPAYMENT GAS-METER

FOR PENCE, SHILLINGS, OR ANY COINAGE.

THE ADVANTAGES OF THIS SYSTEM ARE:

1. Simplicity of Mechanism.
2. Absolute Accuracy.
3. Impossibility of being tampered with.
4. Unaffected by irregularities in shape or thickness of the penny.
5. Can be fixed to any ordinary Wet or Dry Meter.
6. Extra large Money-Box.
7. Price Changer can be altered without otherwise disturbing the Meter.
8. Index showing number of Pennies in the mechanism at any time.
9. Rejection of Half-Pennies certain.

GUARANTEED FOR FIVE YEARS.

FRANK WRIGHT'S PREPAYMENT GAS-METER CORPORATION, Limited,

Telegraphic Address: "Gasometer, London."

Manufacturers of Wet and Dry Gas-Meters.

Offices and Works: 62, GLENGALL ROAD, S.E.

Telephone No. 59 Peckham.

NEW! STARTLING!!

"LUCULLUS" UNIVERSAL

MEAT ROASTING & BAKING APPARATUS

(ENGLISH PATENT, No. 1014).

Roasts any kind of Meat, no matter the size, without Butter or Fat, without Basting and Turning. Burning impossible. The Roast Meat prepared with this Apparatus is unequalled as regards Quality. Loss of Weight is 20 per cent. less. No Competition whatever. Highest Awards.

The Apparatus may be seen working by interested Parties from Eleven to Five at KLEIN'S HOTEL, 38, FINSBURY SQUARE, E.C., in presence of the Inventor,

A. E. BAUTZ, BRESLAU and BERLIN.

BOWENS' Ltd. Successors,

STOURBRIDGE.

MANUFACTURERS OF

BEST FIRE-BRICKS; INCLINED, HORIZONTAL, and SECTIONAL RETORTS; LUMPS, TILES, &c., of every description.

Established 1860.

HARPER & MOORES,

STOURBRIDGE.

MANUFACTURERS OF

BEST FIRE-BRICKS, GAS-RETORTS,

LUMPS, TILES, AND ALL ARTICLES IN FIRE-CLAY.

Proprietors of Best Glasshouse Pot, Crucible, and other Stourbridge Clays.

MANUFACTURERS OF GLASSHOUSE POTS AND CRUCIBLES OF EVERY KIND.

ESTABLISHED 1836.

PETTIGREW'S PATENT

Sulphate of Ammonia Plant

ON THE CONTINUOUS SYSTEM

Is the newest in the Market, and is the outcome of practical experience in Sulphate Making.

Old Systems easily and cheaply converted.

ANY SIZE ERECTED COMPLETE AT HOME OR ABROAD.

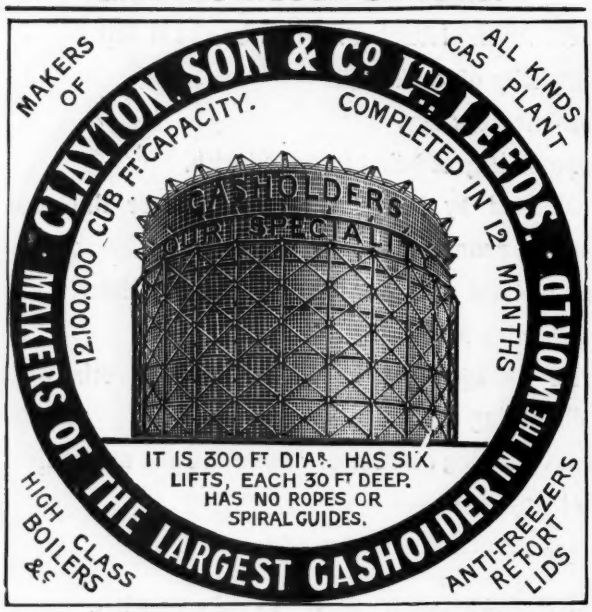
Makers of Self-Emptying Saturators.

Write for Particulars, Testimonials, and References to

GEO. PETTIGREW & Co.,

GAS AND CHEMICAL ENGINEERS,

MIDDLESBROUGH-ON-TEES.


MAKERS OF
CLAYTON, SON & Co LTD LEEDS.
ALL KINDS GAS PLANT
12,100,000 CUB FT CAPACITY.
COMPLETED IN 12 MONTHS
GASHOLDERS
SPECIALITY
IT IS 300 FT DIAS. HAS SIX LIFTS, EACH 30 FT DEEP. HAS NO ROPES OR SPIRAL GUIDES.
MAKERS OF THE LARGEST GASHOLDER IN THE WORLD
HIGH CLASS BOILERS &c
ANTI-FREEZERS RETORT LIDS

GIRDERS, ROOFS, & ALL KINDS OF STRUCTURAL IRONWORK.

London Office: 60, QUEEN VICTORIA STREET, E.C.

Telegraphic Addresses: "GAS, LEEDS," "ECLARAGE, LONDON."

WILSON CARTER & PEARSON,

GAS COAL AND CANNEL FACTORS,

Supply to any Railway Station, or for Export, all kinds of Fuel for Gas purposes.

ADDRESS CHIEF OFFICES:

Temple Buildings, 50, New Street, Birmingham.

WILLIAM INGHAM & SONS,

Incorporated with the Leeds Fire-Clay Company, Ltd.,

WORTLEY FIRE-CLAY WORKS,

Near LEEDS,

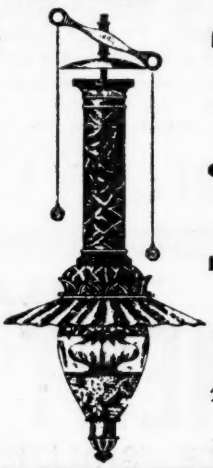
Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT

MACHINE-MADE GAS-RETORTS.

The Climax of Regenerative Gas Lighting!!



THE

"VERTMARCHE"

A 280-Candle Power PLAIN IRON LAMP,

CLASS A— 55/-

LIGHT for LIGHT

less than half the price of any other Regenerative Lamp.

Manufactured in England.

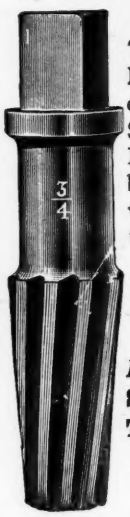
HENRY GREENE & SONS,

153 & 155, CANNON STREET, LONDON BRIDGE, E.C.

PARTICULARS AND PRICES FREE. AGENTS WANTED.

PATENT TWISTED TAPER

RYMERS & TAPS.



These **Patent Twisted Taper Rymers and Taps** are the best ever made for Gas and Water Service Connections. A true Hole and a correct Thread can be assured. They are easy to work, and will last much longer than straight grooved Taps and Rymers.

THOUSANDS ARE IN DAILY USE.

Also SCREWING-MACHINES, STOCKS and DIES (with Patent Twisted Dies), PIPE-TONGS, and other TOOLS.

Apply for Prices and Particulars to

JOHN RUSCOE,

ALBION WORKS, HYDE, near MANCHESTER.

OXIDE OF IRON.

NATURAL BOG ORE FROM OWN MINES.

Samples and Prices on application.

Wm. H. MÜLLER & CO.,

81, PALMERSTON BUILDINGS, LONDON, E.C.

TRADE MARK: "Compascum." Telegraphic Address: "FERRUM."

JOSEPH CLIFF & SONS,

INCORPORATED IN

THE LEEDS FIRE-CLAY COMPANY, Ltd.

WORTLEY, LEEDS.

LONDON OFFICES & DEPÔTS:

Baltic Wharf, Waterloo Bridge.

WHARVES NOS. 2 & 4, INSIDE G.N. GOODS YARD, KING'S CROSS, N.

LIVERPOOL:

16, Lightbody Street.

LEEDS:

Queen Street.

MACHINE-MADE RETORTS

Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.

Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

GODDARD, MASSEY, & WARNER'S

IMPROVED

Sulphate of Ammonia Apparatus.

The most successful and approved Apparatus known up to the present time.

FOR REFERENCES, PARTICULARS, TESTIMONIALS, AND PRICES APPLY TO

GODDARD, MASSEY, & WARNER,

ENGINEERS,

NOTTINGHAM.

The Apparatus has been supplied to the following Firms—

BURT BOULTON, & HAYWOOD, SILVERTOWN, and ELING.
CHANCE BROTHERS, OLDBURY (FOUR APPARATUS).
RUNCORN SOAP & ALKALI CO., Limited, RUNCORN.
NETHAM CHEMICAL CO., Limited, BRISTOL.
ANIMAL CHARCOAL CO., Limited SHADWELL.
WM. BUTLER & CO., BRISTOL.
KEMPSON & CO., Pye Bridge.

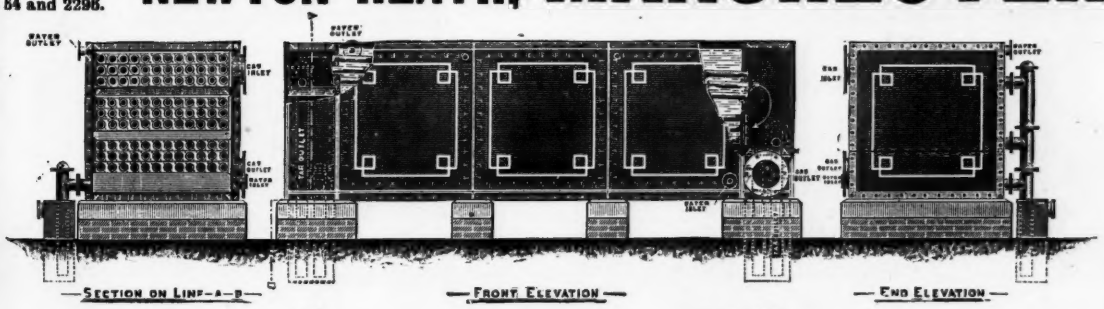
And to the following Gas Companies and Corporations—

ILKESTON.	BURY.	CHORLEY.
WIDNES.	BRIGHOUSE.	WHITEHAVEN.
HALIFAX.	MARKET HARBRO'	CHESTER.
ALTRINCHAM.	PRESCOT.	SOUTH SHIELDS.
DENTON.	SOWERBY BRIDGE.	LEEK.
ST. ALBANS.	LEICESTER.	IPSWICH.
DUKINFIELD.	DARWEN.	BOURNEMOUTH.
NORTHWICH.	NELSON.	SALFORD.
HUDDERSFIELD.	ORMSKIRK.	LUTON.
		HAMPTON COURT.

R. & J. DEMPSTER, LTD., GAS PLANT WORKS,

Telegraphic Address: "SCRUBBER, MANCHESTER." National Telephone Nos. 54 and 2296.

NEWTON HEATH, MANCHESTER.

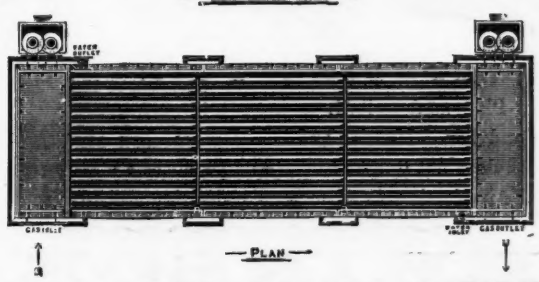


IN ACTION.

SLOW-SPEED,

UNIFORM,

EFFECTIVE.



IN DESIGN.

SIMPLE,

DURABLE,

INEXPENSIVE.

WATER-COOLED GAS-CONDENSERS.

R. & J. D., Ltd., have at present in hand, for at Home and the Colonies, Water Condensers equal to **7,250,000** cubic feet per day.

Particulars, Prices, and Testimonials on Application.

PARKINSON'S New Patent "DRAW-PLATE" GAS-FIRES.

Absolutely no Smell when first lit. Invaluable for use in Bedrooms. Specially adapted for Invalids and Bronchitis Patients. Creates Draught, and ensures Pure Air.

THIS improvement is an adaptation of the old-fashioned Draw-Plate used in Coal-Fires. A light Cast-Iron Plate is placed behind the canopy, and is so arranged that, if desired, it may be drawn down before the Fire is lit. A good draught is thus created; and, in two or three minutes, the plate may be raised again. There are no close fitting Parts, Hinges, or Screws to manipulate; and, if not required, the Draw-Plate need not be used. In the summer months, the Plate may be drawn down like a Shutter, improving the appearance of the Stove when not in use, and protecting the Fuel from Dust.

This new and important improvement has been fitted to Four of our well-known Gas-Fires—viz.,

The No. 2 "PARKINSON," Nos. 6 and 8 "TREASURE," and No. 4 "DOMESTIC;"

Also to a NEW PATTERN for this Season,

The "CRYSTAL."

"DRAW-PLATE" UP.

"DRAW-PLATE" DOWN.

SPECIAL POINTS.

Parkinson's Patent Draw-Plate as described.
Art Tiles fitted at Sides and Top. Massive and bold Design.
Circulating Burner, which does not "light back," and produces a steady regular Flame.
Open Canopy and special Air-Heating Arrangement, producing a good Circulation of Pure Warm Air.

W. PARKINSON & CO.,

COTTAGE LANE WORKS, CITY ROAD, LONDON.

BELL BARN ROAD WORKS, BIRMINGHAM.

[See also Advt., p. 1278.

LONDON: Printed by WALTER KING (at the Office of King, Sell, and Railton, Ltd., 12, Gough Square); and published by him at 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, Dec. 14, 1897.